COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, June, 1934

Costly Air

IF THE AUTHOR of "as free as the air we breathe" had ever studied a mine cost sheet, he would have wracked his brain for a more apposite simile. Mine air, however, might be less costly if management would reexamine the ventilation set-up of its operations with a view to scrapping old fan equipment less adapted to the job than some of the newer developments in this field. Reductions of 30 to 40 per cent in annual power bills frequently follow changes in ventilation equipment, declared one speaker at the Cincinnati convention this year; new fans have paid for themselves in six to ten months, reported another. With such savings in prospect, holding on to obsolete equipment, even in the case of mines which will be worked out in a few years, is not the part of efficient management.

Law and Realities

WHETHER the order of the federal district court at Louisville enjoining the enforcement of bituminous code minimum wages in western Kentucky is sound law is a question best left for the higher judiciary to decide. The legal distinction between mining and interstate commerce is not new. In emphasizing that distinction in the *Coronado case,* however, the Supreme Court also stated that, where Congress deemed "certain recurring practices though not really part of interstate commerce, likely to restrain and burden" such commerce, it had the power to subject these practices "to national supervision and restraint." Legal battles to determine just where and when intrastate activities must yield to interstate regulation have paid many fat fees.

Commercially minded coal operators, however, will be less interested in these nicer legal distinctions than in the practical effects which may follow if the Louisville injunction is sustained on appeal. Whether the particular wage rate enjoined is equitable is not here considered because the issue raised by the decision is so much broader. That western Kentucky sells the bulk of its output in interstate commerce in competition with producers from other fields is undisputed. Wages constitute the largest single item in the cost of production and, consequently, are a major factor in establishing prices f.o.b. mines.

If, therefore, after fair hearing, no power resides in NRA to establish minimum wages, then, except as organized labor may be strong enough to impose its will upon reluctant employers, the whole system of regulation envisaged by NIRA falls. Such a collapse would foreshadow an inevitable return to the vicious competition from which the bituminous industry has so lately emerged—a competition under which neither capital nor labor profited.

The Complete Picture

A MINE with 400 employees, in at least an equal number of places, with many types of personality, is difficult to control. Conditions are only with difficulty summarized. So prompt reports are necessary to give the manager an immediate and complete picture of what is happening, in order that his office can keep sales managers informed as to what deliveries they can promise, and purchasing agents posted as

to what will be needed. Proper reports from the storehouse as to materials used and on hand, with accompanying remarks, will enable the manager to know definitely what the material needs will be and whether excess inventory is being carried or excess material used or wasted. The whole machine of operation will then go forward smoothly. Suitable reports are the very meat of the successful manager.

Throwing Weight on Pillars

WHEREVER mine roof has not fractured clear to the surface, the phenomenon of "throwing weight" is to be apprehended. Engineers are prone to believe that the pillar edge is the fulcrum on which the greatest pressure falls, with the weight decreasing from the exposed face inward. But observation and theory alike confirm the idea that the roof's arch stresses do not strike the pillar edge, but roughly follow a line which, at the face of the pillar, is vertically one-third of the distance from coal to surface. From that point, they plunge down tangentially to the curve of arch stress to reach the coal at a considerable distance from the face of the pillar.

Because of this transfer of weight, life, limb, headings and equipment are more likely to be damaged in the heart of the pillar than at its edges. Cribbing placed at the pillar edge does little or nothing to relieve the crushing stress. Roads in the goaf away from the face of the pillar are least dangerous to those who travel them.

After a bump, stresses readjust themselves, the arch curve takes a wider span and becomes more squat, and little subsidence is in evidence. The support of the arch moves into the pillar to cause bumps in headings farther from the coal face. This appears to be the condition in eastern Kentucky and southwestern Virginia. The action will continue to be mysterious until mining men make more intensive study of the principles already long elaborated and weighed by civil engineers.

Proration

ALLOCATION of tonnage, so vigorously debated at the round table on natural resources at the recent convention of the Chamber of Commerce of the United States, has appealing aspects to those who believe that stabilization cannot be achieved without rigid production control. That, where legally permissible, allocation within a given producing district can be made effective by mutual agreement among the mines involved is unquestionable. The successful operation of Appalachian Coals, Inc., is a convincing demonstration of that fact.

When, however, the scope of the plan is broadened to take in all competing districts, two very practical difficulties intrude. The last twenty years has witnessed marked shifts both in actual tonnages and in the percentages of the total soft-coal output supplied by different fields. Any attempt to fix a basis for apportionment, therefore, would invoke irreconcilable differences between competitors who wanted to preserve present tonnage relationships and those who wanted to revert to earlier relationships. Imagine agreement between West Virginia and Illinois on this point!

The consumer, too, must be considered. It is one thing to zone shipments, as was done during the War, when the adequacy of the total supply is in doubt; it would be quite another thing to try such a system when every producing district has a huge surplus capacity. Telling the consumer where he must buy is always a dangerous procedure; it would be doubly hazardous when substitute fuels also are making a drive to win him away from coal entirely.

The Darrow Report

EX PARTE REPORTS usually make interesting reading because the authors seldom feel the urge to clutter up their findings with any evidence which might not support their predetermined views. The majority report of the Darrow NRA Review Board is no exception. To anyone familiar with bituminous coal, the statement that "monopolistic practices are marked in this industry" would be laughable were it not for the fact that many sincere but uninformed persons may accept that indictment as true. The suggestion that two subdivisional code authorities be dismissed "for malfeasance in office" is unwarranted by any facts cited in the report. As an advocate of complete socialization, Mr. Darrow hardly can be expected to favor any system which would shore up our present weakened capitalistic structure and, if glorifying the chiseler will defeat that system, why balk at self-contradictory arguments in the glorification process?

CENTRAL CLEANING PLANT

+ Helps Avella District Producers

To Recover Lost Markets

By JOSEPH PURSGLOVE, JR.

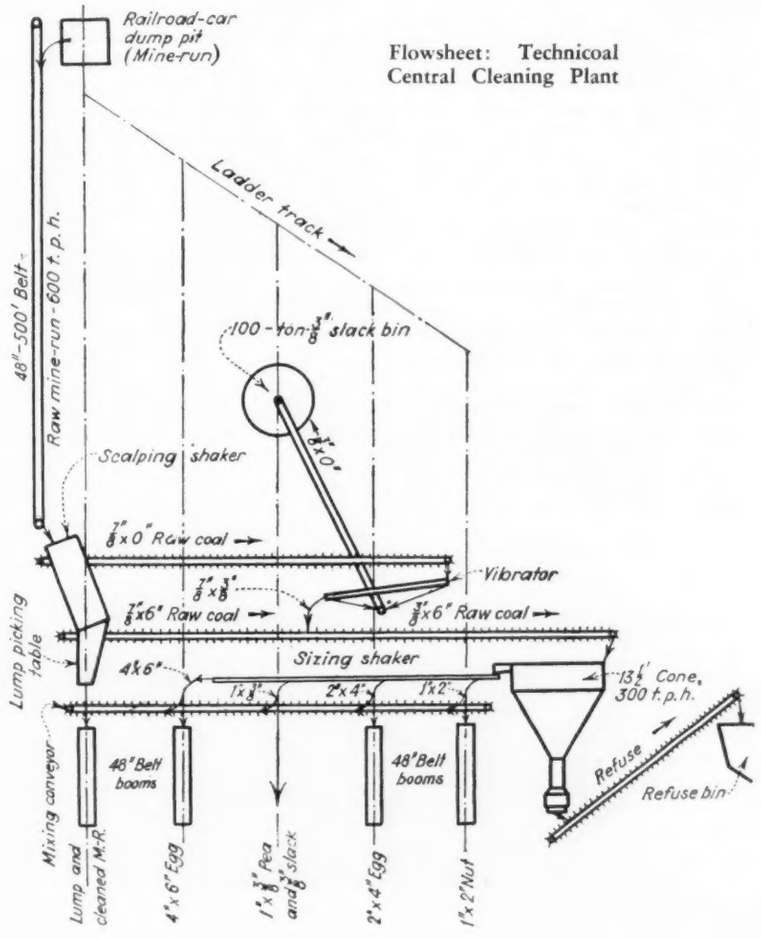
Consulting Engineer
Cleveland, Ohio.

AS THE tonnage of mechanically cleaned coal from western Pennsylvania mines increased from year to year, it became more and more difficult for operators in the Avella district to find a market for their raw coal, hand-picked only in the plus 2-in. sizes. Inasmuch as the tonnage shipped from the Avella district mines shrank at least 60 per cent between 1928 and 1932, it became apparent that steps had to be taken to improve the quality of the coal produced in the district to a point where it might again be sold competitively in the market. Under code operation cut-rate prices could not be resorted to as a means of recapturing lost markets; moreover, in the five years prior to the code, markets were continuously lost, even though the coal was offered at extremely low prices.

There are six mines producing in this district, and as all six were beset with the same marketing difficulties a central coal cleaner bade fair to become a welcome solution to their problems. The Acme Coal Cleaning Co. was incorporated in 1932 to construct and operate a centrally located community cleaning plant, employing the Chance sand-flotation process, to handle mine-run coal from mines in this district. In March, 1933, actual steel construction was started on the plant, which was erected by Heyl & Patterson, Inc., adjacent to the Avella yard of the Pittsburgh & West Virginia Ry. The first car of raw coal was dumped on June 5, 1933, and the plant has been handling several hundred cars each month since that date. The cleaned coal is marketed by the Technicoal Sales Corporation of Pittsburgh, under the copyrighted trade name of "Technicoal," and the plant is known as the Technicoal cleaning plant, located at Technicoal, Pa.

Raw coal is dumped into the railroad car pit, 500 ft. from the main tipple and cleaning-plant structure, and is conveyed up and into the plant on a 48-in. belt conveyor with a capacity of 600 tons per hour. Empty railroad cars then gravitate to any one of the five loading tracks under the tipple, where they are reloaded with cleaned and screened coal.

Inside the plant, the raw coal is first run over a scalping shaker screen to remove the 6-in. lump, which is then hand-picked. This screen also removes the minus $\frac{7}{8}$-in. coal from the mine-run feed. The $\frac{7}{8}$x0-in. coal is then conveyed to vibrating screens, which remove the minus $\frac{3}{8}$-in. for bypassing around the 13½-ft. Chance cone. The $\frac{7}{8}$x$\frac{3}{8}$-in. oversize from the vibrators is chuted to the cone-feed conveyor, where it joins the 6x$\frac{7}{8}$-in. sizes removed from the run-of-mine feed on the primary scalping screen. Thus the raw feed to the cone includes all sizes between 6-in. and $\frac{3}{8}$-in. After desanding and dewatering, the



Flowsheet: Technicoal Central Cleaning Plant

cleaned coal from the cone is screened into 4x6-in. egg, 2x4-in. egg, 1x2-in. nut, and ⅜x1-in. pea. These sizes may be loaded into railroad cars separately or remixed, as required, to make any special sizes for the trade. The by-passed ⅜-in. slack is conveyed to a bin for direct loading or is admixed with the washed pea, or nut and pea sizes to form a low-ash, high-quality, 1- or 2-in. slack. Upon leaving the dewatering screens the coal is sprayed with a chemical solution designed to improve its combustion characteristics. This same chemical formula has been used for several years by the Powhatan Mining Co. at its Powhatan cleaning plant.

In view of the raw-coal-input capacity of 600 tons an hour, a surprisingly small number of men are required for the entire job of unloading, screening, cleaning and reloading. The total operating force on the Acme payroll is as follows:

Position	*Number of Men*
Superintendent	1
Washery Boss	1
Pump and Slate Gate Attendant	1
Lump Pickers	2
Handling Raw Coal Cars and Dumping Raw Coal	4
Car Dropper	3
Tipple Operator	1
Greaser	1
Maintenance and Repairmen	2
Coal Inspector	1
Clerk	1
	18

As the plant owns a 450 kva., 25,000/440 volt substation, power is purchased from the West Penn Power Co. at the high-line voltage. The maximum demand registered for the entire plant is 250 kw., and the average demand will be close to 200 kw. Cost of maintenance, sand and supplies for the whole plant has been running consistently less than 1.5c. per ton.

The problems of a community cleaning plant handling coal from the mines of several different companies and whose sole source of income is from a flat cleaning charge per ton are numerous. When planning the construction of the Technicoal plant, there was no precedent to follow. Such problems as computing a fair charge per ton for the cleaning and screening service, means of keeping proper records of the raw coal shipped from different mines, and a fair method of paying the mines for raw coal had to be worked out by the officers of the cleaning company on a cut-and-try basis.

To arrive at a fair charge per ton for the services performed by the plant, actual costs of labor, supplies and maintenance were easily estimated after the first month's trial operation. The item of fixed charges, including interest, depreciation, insurance and taxes, had to be reduced to an average per-ton figure for an average anticipated annual production. The plant was designed to handle at least 150,000 tons per month, although to develop new markets for such large tonnages would require many months, if not years, it was fully realized.

Several different report forms were proposed for keeping accurate record of the coal handled by the plant. One set of reports was evolved for the raw, incoming coal, which states the mine from which the coal was received, the size of coal, and the incoming railroad weights. Columns are provided on the report blank for notations as to the screening percentage of the particular mine's coal as determined by occasional tests, and also for notations concerning the average quantity of impurities usually found. Another complete set of reports must be kept to give the necessary shipping data on the washed and screened coal ready for market.

Whether or not a central-cleaning-plant installation is justified as compared to several individual plants at each mine in a district presents an interesting problem in coal-cleaning economics. The transportation cost of the raw coal from the mine to the cleaner is the largest single factor of excess expense involved in central-cleaner operation. The published railroad tariff for this movement is $2 a car, so that the charge when using 50-ton cars is between 4 and 4½c. per ton. This represents a large portion of the total overall cost of operation. There also is a duplication of labor to a certain extent in that the coal must be loaded at the mine, unloaded at the plant, and reloaded again. This does not amount to as much as one would first imagine; in fact, it is less than 1c. a ton. Had there been a cleaner constructed at each tipple in the Avella district, where there are several mines varying in production capacity from 500 tons to 2,000 tons a day, there would have been an extravagant duplication of capital and labor charges. This duplication would undoubtedly amount to more than the 5c. required for the transportation and double handling of the coal. If, however, the Avella district had several 4,000-ton-a-day mines, each with many thousands of acres in coal reserves, a central cleaner, adding 5c. or 6c. per ton to the cost of preparation, would have been impractical. Central cleaning plants, therefore, may not be installed at random with the supposition that they are always economically justifiable. The daily capacity of the mines and their available coal reserves must be taken into account in each case.

What the cone cleaner in the plant is accomplishing in the way of beneficiation to the coal is shown in the table below.

Size	*Per Cent of Ash in Raw Coal*	*Per Cent of Ash in Cleaned Coal*
4x6-in. Egg	8.25	6.66
2x4-in. Egg	9.86	6.33
1x2-in. Nut	12.02	6.50
⅜x1-in. Pea	12.84	6.25
2-in. Nut and Slack	13.52	7.20

The 6x⅜-in. refuse from the cone averages 56.10 per cent ash.

Indicative of the success of this undertaking is the fact that the mines using the plant are now unable to meet the market demands. A plan is now under way to increase the daily production of the mines served by the plant and at the same time to open one or two additional mines to make a greater supply of raw coal available. Under the code scale of prices approximately 25c. per ton more must be obtained for Avella washed coal than for Avella raw coal. It is apparent that the sales organizations marketing each of these grades find no difficulty in disposing of their cleaned product at 25c. a ton increase.

The marketing experience with this plant over the past ten months seems to furnish the ultimate answer in the affirmative to the question raised by the great majority of coal operators today: Is coal cleaning a profitable venture?

SCOTIA POWER PLANT

+ Generating Both A.C. and D.C., Cuts Energy Consumption 25 Per Cent

By J. H. EDWARDS
Associate Editor, Coal Age

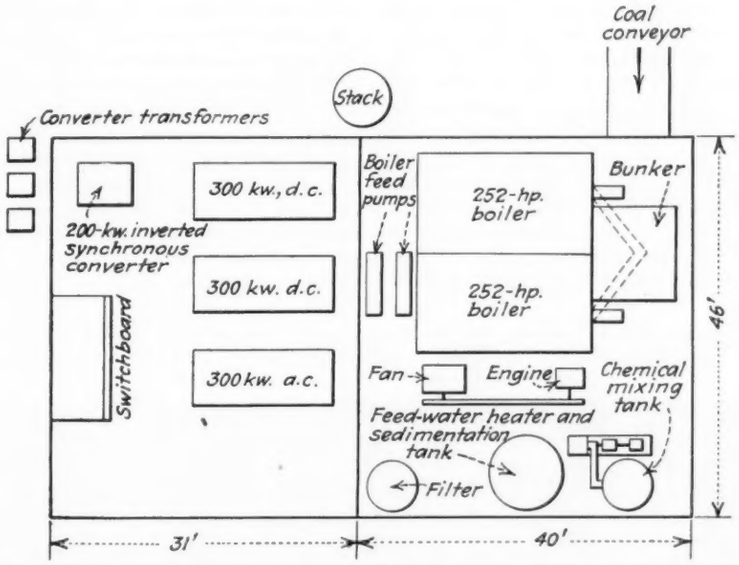
FIFTEEN to twenty years ago, when many coal mines were abandoning their direct-current generating plants for purchased power, one argument advanced in favor of the change was an anticipated saving in energy consumption due to transmission at 2,300 volts alternating current or higher to substations located near the load centers, instead of transmission at 250 or 550 volts direct current. No doubt a saving did accrue in many cases, but now comes to light an instance where a recent shift from purchased power to mine-generated power effected a saving of 25 per cent in kilowatt-hours per ton of coal mined, this due to generating a part of the plant output as direct current and thus eliminating conversion losses.

That is but one of several interesting features of the new power plant of the Scotia Coal & Coke Co., located at Brooklyn mine, in the New River field, Fayette County, West Virginia. Engine-room equipment includes a synchronous rotary converter operated inverted to assist the alternating-current generator; the prime movers are non-condensing geared turbines; boilers are equipped with stokers which are under automatic control; and feed-water treatment is of the hot-water type. The plant has been in operation over a year, a sufficient length of time to provide truly representative data as to fuel efficiency and operating cost. "We believe that the operating savings of the new plant," says S. Austin Caperton, general manager, "will return the investment in something over four years, interest included, and fuel charged at market price."

The Scotia Coal & Coke Co. was the first in the New River field to install a demand limiter to reduce power cost. It was in 1927 that the rate schedule was changed from a "contract demand" to a metered 15-minute demand. The limiter was installed by Scotia in 1928, and, as described in *Coal Age* (Vol. 34, p. 242), the device reduced the demand portion of the power bill over $60 per month, although the tonnage was increased. Inquiry as to whether the demand limiter is being used, now that power is being generated, was answered in the negative, and an official added, "we don't need a demand limiter now." The fact is, a 15-minute demand limiter having its measuring element connected to total the plant output would be of little value because an overload beyond the capacity of a turbine will in a few seconds slow it below the operating limit. The regular overload trips of the generator circuit breakers serve as the demand limiters.

This mention was made of the limiter to indicate that the coal-company officials have been "power conscious" for several years and no doubt had taken steps to reduce energy consumption. The saving of 25 per cent as compared to operation under conditions that can be assumed to have been reasonably efficient, by the change to direct-current generation, therefore is the more impressive.

Three mines are operated by power generated at the new plant. These are Brooklyn and Rush Run mines of the Scotia Coal & Coke Co. and South Side mine of the South Side Co., an affiliated organization. Total production of the three mines is about 1,500 tons per day. The power plant is within 2,000 ft. of the old converter-substation (Scotia substation) which supplied direct current to the Brooklyn and Rush Run mines. Alternating current at 2,300 volts and direct current at 600 volts are transmitted from the new plant



Scotia Plant, Showing Arrangement of Equipment and Floor Dimensions.

to the busbars of the old substation and from there are fed over the original lines to the Brooklyn and Rush Run mines. The South Side mine is supplied by a two-mile 2,300-volt transmission line leading direct from the power plant to the South Side substation.

Direct current from the Scotia distribution point (formerly the converter substation) is transmitted one mile overground to a borehole 300 ft. deep, thus feeding the Rush Run mine workings by a short cut to the central point. The distance from the power plant to the drift opening of this mine is two miles. The alternating current for operation of outside equipment is transmitted over this distance at 2,300 volts.

The load taken over had been totaling approximately 176,000 kw.-hr. per month and the combined maximum demand of the two metering points totaled approximately 700 kw. As to largest motors included in the load, an important detail when considering the construction of a power plant, the largest motor is a 150-hp. mine-pump motor and the next largest is a 65-hp. hoist motor at a man and material incline. The pump motor can be shut down during peak mine loads.

Life of the mines, quality and quantity of water supply, and the cost and suitability of fuel are three principal considerations entering into the design of a power plant. In this instance the remaining life of the mines is estimated at 30 to 40 years; the water supply consists principally of that pumped from a mine but includes some surface water during all but very dry periods; and the fuel consists of Sewell-bed machine cuttings averaging approximately 14,500 B.t.u., 23 per cent volatile, and 5 per cent ash. The water is not difficult to treat, but the supply would not be sufficient for condenser cooling unless a cooling tower or spray pond were included in the project.

Steam-generating equipment consists of two 252-hp. welded drum Stirling-type water-tube boilers, 200 lb. pressure, 100 deg. superheat, equipped with underfeed stokers. Engine-room equipment consists of three 2-stage 5,450-r.p.m. non-condensing turbines each connected to a 300-kw. 1,200-r.p.m. generator through a Type S55 General Electric speed reducing gear. One unit generates 60-cycle, 2,300 volts alternating current, and the other two units generate 600 volts direct current. From the displaced substation at Brooklyn mine a General Electric 200-kw. Type TC 600-volt synchronous converter was moved to the power house to serve for converting direct current to alternating current or alternating current to direct current, as the loads may demand. Thus a wide range of flexibility is provided and this allows the loading of all units to capacity if occasion demands, or allows the shutting down of all but one of the units during periods of light load.

The Plant Is in a Valley but "Back on the Hill" From New River.

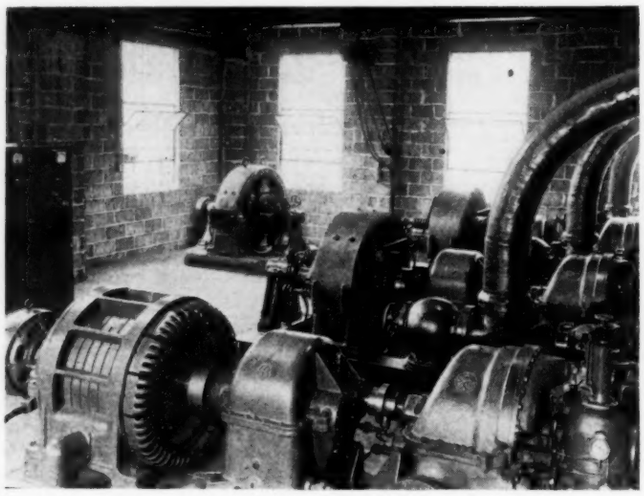
Boilers and stokers are rated 240 per cent overload and after installation were tested as high as 300 per cent overload for three hours. The water level in the boilers is automatically controlled by feed-water regulators; stoker speed and both forced and induced drafts are governed automatically to maintain uniform steam pressure, and the boilers are equipped with Diamond soot blowers. Induced draft is provided by a guyed steel stack 5 ft. in diameter and 150 ft. high above ground level. The lower third is made of $\frac{3}{16}$-in. plate, the next section of No. 8 gage, and the top section of No. 10 gage.

The stoker engine is a single-cylinder, vertical, 5x6-in. unit. The fan, a Clarage Type R size No. 70, is driven by flat belt operating on the engine flywheel. On the opposite end of the engine crankshaft is a sprocket over which operates a silent chain driving the stoker line shaft. Feed pumps, two in number, are Worthington reciprocating type, size 7½x4½x10-in.

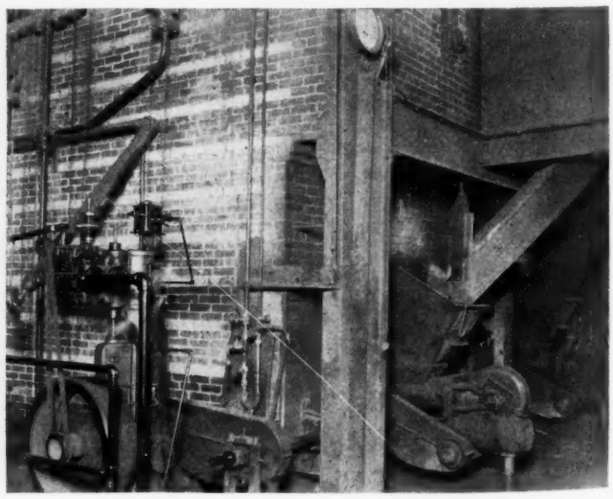
Hot-water treatment and filtering equipment for boiler-feed water consists of a chemical mixing tank with centrifugal pumps, jet-type feed-water heater, sedimentation tank, and filter. The heater and sedimentation tank are built as one unit. Pumps are direct-driven from a Crocker-Wheeler 3-hp. 1,720-r.p.m. induction motor, and from a pulley mounted on the motor shaft between motor and pumps there is a flat-belt drive to the agitating propeller in the mixing tank. One of the two centrifugal pumps circulates treating liquid from mixing tank and back again past an orifice through which the chemical is fed to the suction of the second pump. This latter pump forces the chemical into the raw-water feed line.

Feeding the chemical is continuous and is automatically proportioned to the flow of raw water. This is accomplished by means of a measuring orifice

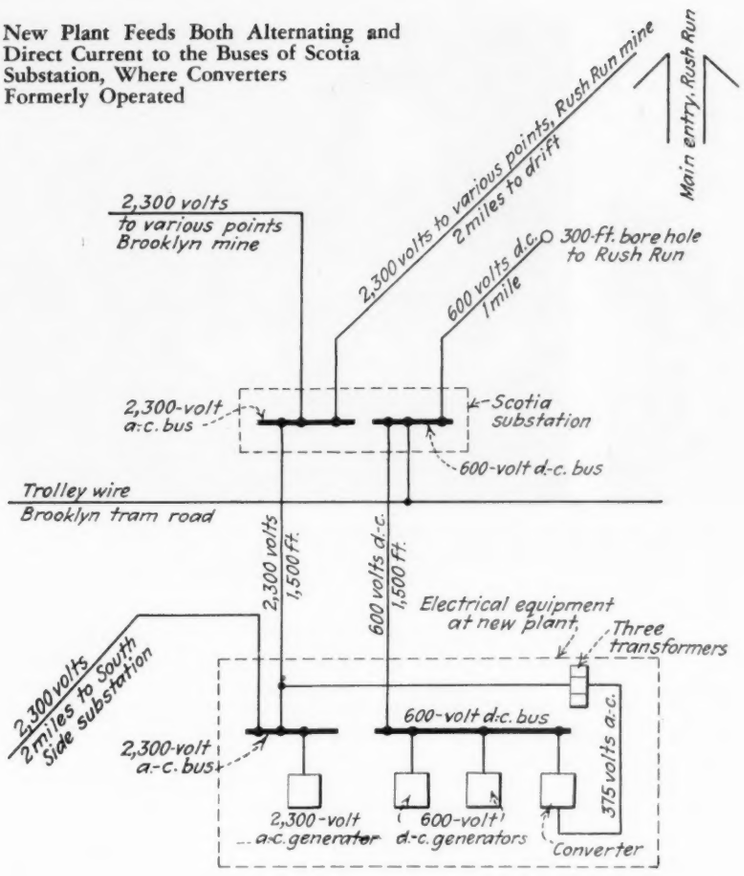
A.C. Geared Turbo-Generator in the Foreground; Two of the Same Type, but D.C., in the Background; Tie Converter Back in the Corner.



Underfeed Stokers at the Scotia Power Plant Are Driven by the Same Engine Which Drives the Forced-Draft Fan (Stokers Appear at the Right).



New Plant Feeds Both Alternating and Direct Current to the Buses of Scotia Substation, Where Converters Formerly Operated



installed in the raw-water feed pipe. Pressure head across this orifice controls the head of liquid on the orifice through which the chemical is admitted to the chemical feed pump. Lime and soda ash are the chemicals used the greater part of the time.

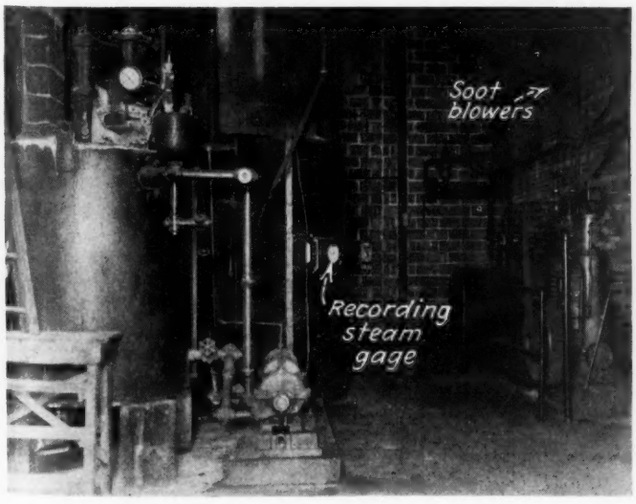
The feed-water heater is equipped with vent condenser on the top. Here the hot gases passing from the heater to atmosphere give up most of their heat to the raw feed water which is circulated through the condenser tubes before entering the heater. The chemical is mixed with the feed water just before it enters the heater and is about to be sprayed into direct contact with the exhaust steam from the turbines. Sedimentation of any precipitate resulting from chemical action takes place in the water storage space at the bottom of the heater, and the hot water going from this sedimentation space to the filter must flow upward through a cone located below water level and set with the large end downward. The bottom of the heater is cone-shaped, small end down, and from its apex the sediment can be blown out by manual manipulation of a drain valve. This combination heater and sedimentation tank is equipped with automatic overflow.

The filter is filled with Cochrane special filtering material, and the capacity is 4,300 gal. per hour at a rate of 3 gal. per square foot per minute. This hot-water method of feed-water treatment is said to have the advantage of requiring considerably less chemical than the more common methods.

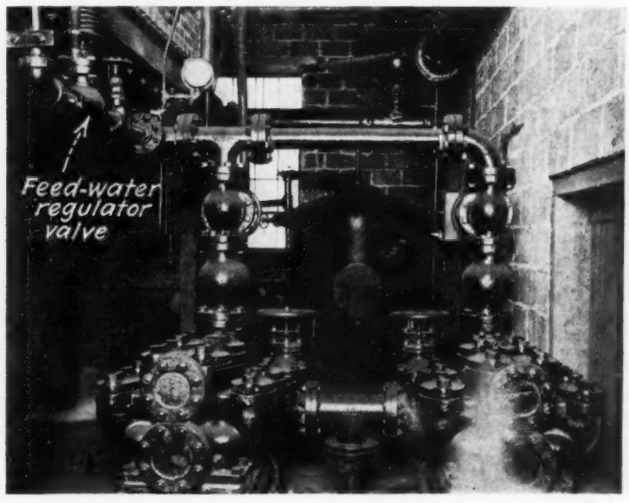
During periods when mine water only is available, some gypsum must be introduced to supply the sulphates necessary to maintain the proper sulphate-carbonate ratio. This gypsum is introduced by means of the lime-and-soda-ash equipment, but at these times the soda ash is omitted entirely. The mine water is slightly alkaline. The surface water is used as far as possible, although it is slightly "harder" than the mine water. With this harder water, less care is required to maintain the desired sulphate-carbonate ratio. The feed usually is a mixture of both waters, because the discharge from the mine pump flows into the same pond as does the small stream. This shallow pond—capacity about 150,000 gal.—is held by a short concrete dam. From the pond the water for boiler feed is pumped to a new 30,000-gal. wooden storage tank located at a higher elevation on the hillside.

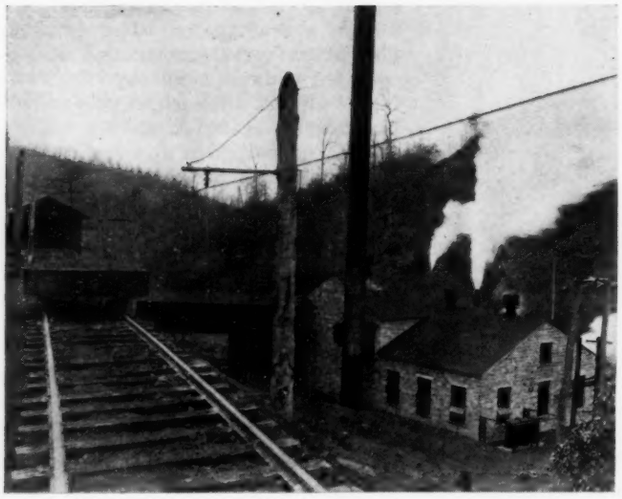
The pond is located about 1,000 ft. from the power plant and close beside a Pomona 5-stage 10-in. centrifugal deepwell pump which raises water from workings of the Rush Run mine in the Fire Creek seam. This pump, powered by an Allis-Chalmers 150-hp. induction motor, is rated 1,400 g.p.m., and the depth is 262½ ft. to the end of the screen pipe. The borehole is 15 in., impeller bowls are 13 in. outside diameter, and the pump casing is 10-in. pipe in 10-ft. lengths. Water-lubricated guide bearings of rubber are located at joints of

Left, Chemical Mixing and Sedimentation Tanks; Right, Steam Engine and Forced-Draft Fan Beside Boiler Setting.



Feed Pumps Are Back of the Boilers. Forced-Draft Fan Is in Left Background and Filter in Center Background.





Mine Cars Loaded With Machine Cuttings Are Emptied in a Rotary Gravity Dump; Cuttings Are Carried to the Boiler Room by Conveyor.

The Turbine Pump Housed in This Building Delivers Mine Water to the Pond for Boiler Feed. The Power Plant Is in the Background.

10-ft. sections. This pump was put into service in November, 1930, two years before the power plant was built, and has operated to date without attention. The pump house is built with an inclosed tower in which is installed a Wright 10-ton 25-ft.-lift chain block.

Cost of the building housing the power-plant equipment was held to a minimum consistent with obtaining one of permanent construction and low maintenance cost. Walls are cinder-block concrete; the roof supporting structure is of steel; the roof covering consists of Robertson asbestos-protected metal; and the windows are steel sash. Approximate inside dimensions of the boiler room are 40x60 ft. and the height to the eaves is 29 ft. The engine room is 31x46 ft.; and the eaves height, 19 ft. Two ventilators, of generous size, are mounted on the roofs of each room. These ventilators also are made of the Robertson protected metal. Ceiling or roof condensation has not occurred to the extent that is is a difficulty, even though the roof consists of but one thickness of the protected metal without other insulation. The climate is such that sub-zero temperatures occur but a few times during an average winter.

Turbines, reducing gears, and generators are all standard equipment used by industry in such quantities as to sell at relatively low prices. The three units are mounted on a heavy structural steel base requiring minimum foundation and installation expense (the Scotia plant is built where there is but 3 ft. of loose material over unbroken bed rock). The generating units are approximately 14 ft. long, 4½ ft. wide and 5 ft. high. The exciter of the a.c. generator is overhung and is rated 5 kw. 125 volts. Operating at the usual day loads encountered, water rates of the generating units are calculated to be averaging approximately 40 lb. per kilowatt-hour. Connected to pipe tees adjacent to the exhaust connections of each turbine are relief valves adjusted to open at 7½ lb. pressure in case of difficulty to the main automatic valve which maintains back pressure on the feed-water heater.

Each turbine is self-contained, including reservoir, oil pump and oil cooler. These coolers are of the surface type for water circulation. At the Scotia plant, the water supply is sufficient to allow waste of this cooling water, but with all three turbines in operation the quantity required almost equals that used for boiler feed. If necessary, this water could be saved for boiler feed or could be cooled for recirculation, but either one would require an additional investment for equipment.

The switchboard has nine panels. An electrostatic ground detector is mounted above the board, and in the same position but on a swinging bracket are two voltmeters for the a.c. and d.c. generators. On a small panel at one end of the board is mounted an a.c. voltage regulator of the vibrating contact type.

Three panels from the displaced substation were utilized for control of the inverted rotary. A resistance and a three-step knife switch were added to the panels for starting the rotary from the d.c. power. A frequency indicator also was added. The automatic reclosing circuit breaker was retained in the d.c. circuit as protection in connection with the overspeed device on the converter shaft. Considerable care is required when operating a synchronous converter from the direct current due to the inherent tendency to overspeed with sudden changes of load when not operating in parallel with another a.c. generating source, but the Scotia installation has been operated in an entirely successful manner.

Over a period of a year the average fuel consumption of the power plant was 8.75 lb. of coal per kilowatt-hour of station send-out, and the maximum and minimum for various months of the year were 10.8 lb. and 7.20 lb. Calculated on a thermal basis, the efficiency averaged 127,000 B.t.u. per kilowatt-hour, a relatively high efficiency for a non-condensing plant with 300-kw. units and operating at the low capacity-factor to be expected with the type of load served. Around 500 tons of machine cuttings are consumed during an average month.

The plant was put into operation on Jan. 9, 1933, and at the time of this writing, as expressed by an official of the company, "not one minute's delay to coal production has been chargeable against operation of the power plant." Total cost of the plant was somewhat less than $90 per kilowatt of generating capacity.

Brooklyn Equipment Log

Boilers, superheater and smokestack	Babock & Wilcox Co.
Stokers	Detroit Stoker Co.
Induced-draft fan, stoker and fan engine	Clarage Fan Co.
Soot blowers	Diamond Soot Blower Co.
Feed-water regulators	Bailey Meter Co.
Feed-pump governor	Fisher Governor Co.
Steam-pressure regulator	National Regulator Co.
Boiler non-return valves	Golden-Anderson Valve Mfg. Co.
Feed-water pumps	Worthington Pump & Machinery Corporation
Recording steam-pressure gage	Foxboro Co.
Chemical mixing tank, feed-water heater and sedimentation tank, filter	Cochrane Corporation
Valves	Walworth Co.
Turbo-generators, switchboard, and voltage regulator	General Electric Co.
Building roof steel fabrication	Fireproof Products Co.
Roofing and ventilators	A. H. Robertson Co.
Steam traps	Armstrong Machine Works

POWER SCRAPER

+ Speeds Culm Recovery

And Reduces Cost

By C. E. ASHCRAFT

Consulting Engineer
Pittsburgh, Pa.

Scraper Working on End of Culm Bank.

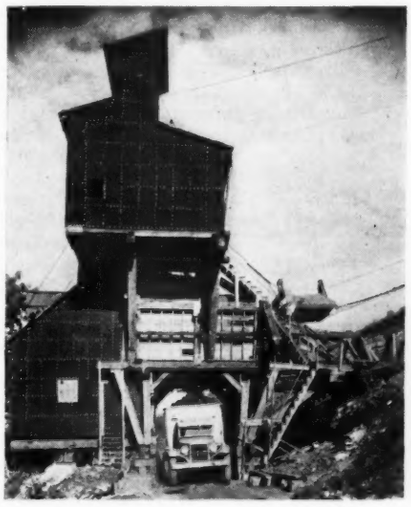
POSSIBLY one of the largest power drag-scraper installations in the anthracite region for the reclamation of culm-bank material has been in operation near Shamokin, Pa., since early in 1932. This installation supplies the washery of the Stevens Coal Co. from a waste pile extending along a hillside for a distance of over a mile from the plant. Until the autumn of 1931, the culm was sluiced to the washery. By that time, sluicing had progressed to a point 500 to 600 ft. from the plant, and was becoming uneconomical because of the distance. Accordingly, it was decided to contract for the reclamation of the rest of the material.

A Pittsburgh contractor, Walter S. Rae, submitted a bid based on the use of a power drag scraper and large trucks, and was awarded the contract. Specified rate of delivery was 1,000 tons per 8-hour day, and, as the pile was calculated to contain 1,500,000 tons of material, it was estimated that the job would require approximately five years. Work was started early in 1932, and average rate of recovery to date has exceeded the specified minimum by about 20 per cent.

Physical conditions pointed to the scraper method of recovery as the most advantageous. The culm pile had been deposited on a hillside with a fairly uniform slope of 25 deg. by side-dump cars operating on a narrow berm excavated in the hill, which had then been extended out to an average width of 100 ft. by the material itself. The culm assumed a slope of approximately 1 on 1½, and formed a pile with a maximum depth of about 50 ft. at the top of the slope, feathering out to zero at the foot. The berm at the top was approximately 250 ft. above the foot of the slope, and the length of the pile, measured along the slope, was about 500 ft. The extent of the pile and the steepness of the hill militated against the use of shovels and revolving draglines, leaving some form of long-range excavation as the only practicable solution. As haulage considerations and the location of the dump made it desirable to reclaim in a downhill direction, the power drag scraper was indicated rather than the slack-line cable-way excavator.

In designing the plant, it was recognized that mobility was an essential requirement. Consequently, it was decided to drag the material into a truck-loading bin mounted on wheels and running on a track built on a berm close to the foot of the pile. A steam shovel was used to make the side-hill cut and fill for the berm, which has a width of approximately 30 ft. and is surfaced with "red dog." This berm serves as a subgrade for the bin track and a road for the trucks. "Red dog" was selected for surfacing because it packs tightly and drains well, reducing wet-weather troubles. The berm was built on an average grade of 4 per cent down to the washery, which favors both the haulage and the movement of the heavy bin.

Movable Truck-Loading Bin.



The bin track is 12 ft. wide center to center of the rails, with its center line 30 to 40 ft. from the foot of the pile. Each rail is laid on 12 in. x 12 in. x 4 ft. ties. No through ties are used, and the track is not ballasted. Only 66 ft. of track—two rail lengths—is used, the bin being moved forward one rail length at a time. The bin is equipped with twelve 18-in. wheels and is moved by one of the trucks, another being hooked on behind as a snubber. On account of the grade, wheel chocks are needed to hold the bin in operating position.

The bin is a combination timber-and-steel structure, which was built at the contractor's yard in Wilkes-Barre, Pa., knocked down and re-erected on the job. It includes a cubical hopper with a capacity of approximately 100 cu.yd., or tons; a gallows frame at the top to support the two scraper guide blocks; a hinged timber ramp which bridges the gap between the bin and the pile; and two double-drum electric hoists, one of 150 hp. for operating the scraper and one of 30 hp. for shifting the scraper tail hitch. The scraper hoist is mounted on a steel-beam support at the bottom of the structure, overhanging the side away from the pile. The beams on which the scraper hoist rests are suspended by steel hangers from other overhanging steel beams on a level with the top of the hopper, and the latter are in turn suspended by cables from the top of the gallows frame, which is securely braced to the top of the hopper. The hoist support is blocked up when the bin is in operating position to relieve the structure of the weight.

The shifting hoist is mounted on the top of the bin, and the controls for both

hoists are carried up to the operative's position at this point, where an unobstructed view is available. When moving, the hinged ramp is raised by attaching the pull-back cable to the outer end and lifting it with the hoist high enough to clear the ground. With a maximum load of culm, weight of the bin is approximately 190 tons. Moving weight is about 140 tons, 50 tons of culm being retained in the hopper to prevent overturning downhill.

The regular scraper has a capacity of cu.yd., and a 3-cu.yd. spare is kept on hand for use when the main scraper needs repair. Operating span varies from 500 to 550 ft., and average length of haul is 300 ft. The scraper is not equipped with teeth, but a heavy manganese-steel cutting edge is employed. Manganese-steel runner shoes also are used on the outside of the sloping bottom plates to protect them from abrasion. Both cutting edge and runner shoes are replaced every two months.

Digging is not difficult, but the material does not cave and stands steeply, so that it is necessary to peel it off in thin layers, rather than with deep cuts. Average capacity of the equipment has been about 1,200 tons per day, but daily records of 1,800 to 2,000 tons have been made when conditions were favorable.

Operations were started with the conventional form of tail bridle with a span of approximately 200 ft. between log anchors, or deadmen, buried in the hill above the culm pile. The plan originally called for running the scraper at the surface of the ground on the foot of a slope established in the culm on the washery side of the line of operation, and for digging in roughly parallel lines, the tail block to be shifted progressively in one direction by manually operated tackle. Failure of the material to cave, however, necessitated frequent shifts of the tail block to facilitate shallow cuts, and the interference with operations thereby resulting led to the adoption of a more convenient tail arrangement.

The main bridle anchors were changed to allow for a span of about 800 ft., and were located somewhat farther up the hill. A 1½-in. bridle cable was stretched between the anchors, allowing for a deflection of about one-third the span. A triangular frame of 12-in. steel I-beams, 20 ft. on a side, was then built. This frame rests horizontally on the berm at the top of the pile, with one corner, carrying the tail block, projecting slightly over the top of the slope. A single block is attached to each of the back corners of the frame, and double blocks are attached to the bridle cable by clamps at points about 200 ft. apart. A three-part tackle of ⅝-in. cable is reeved between each set of double and single blocks, and the lead line of each is carried through the air to a drum of the shifting hoist on the bin.

By winding up one shift cable and paying out the other, the triangular frame carrying the tail block can be shifted sidewise in either direction. By winding up both cables simultaneously, the frame can be shifted back toward the bridle cable. It thus keeps the tail block in proper relation to the top of the slope as the latter recedes. By slacking off both cables and tightening up on the operating cable, the frame and block can be moved forward. Though the frame weighs over a ton, it slides readily over the level berm.

The entire scraper operation is under the complete control of the operative, and additional labor at the tail end is required only when it is necessary to change the tackle attachments to the bridle cable or to change the bridle cable itself from one set of anchors to the next. As the pile is removed at the rate of only 3 to 4 ft. per day, such changes are infrequent, and therefore the labor cost and time loss are practically negligible. The successful solution of this problem had a most important bearing on the success of the job as a whole; otherwise, satisfactory operation would have been impossible.

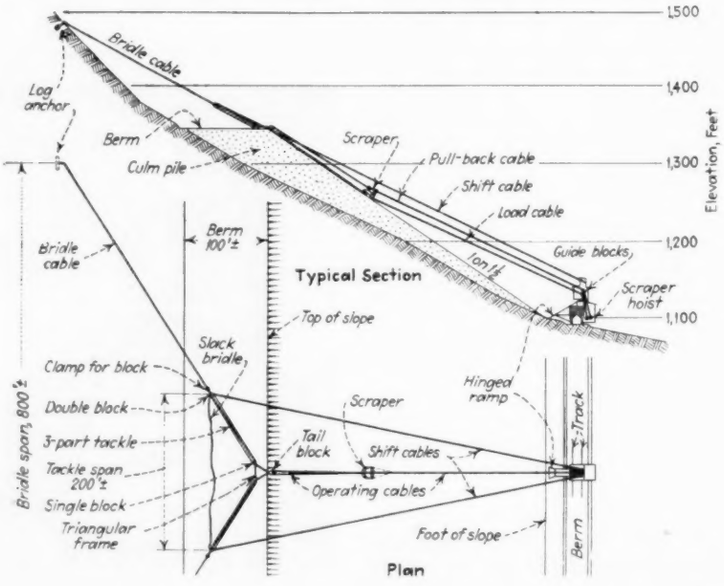
The pull-back cable passes through two sets of rollers on the top of the scraper and thus offers an additional means of controlling the latter, as it can be lifted clear of the ground and brought in line with the head and tail blocks at any point within the span by tightening up on both operating cables. When the empty scraper is approaching the tail blocks, the tension in the pull-back cable is sufficient to lift the triangular frame off the ground until the scraper stops. When the empty scraper starts away from the bin, sufficient tension is maintained in the operating cable to cause it to ride the pull-back cable on the rollers for 100 ft. or so before it strikes the surface of the bank.

One 10-cu.yd. and two 15-cu.yd., 6-wheel, heavy-duty trucks are used for hauling. They load under the hopper through bottom gates. As reclaiming started at the end of the pile farthest from the washery, making the hauling distance almost a mile, three trucks were necessary. As the distance shortens, two trucks, and finally one, will be able to handle the required volume of material.

Power is brought to the project from a 22,000-volt line a mile away, the job power line being supported on poles along the lower side of the berm. Plug-in boxes were installed at intervals, from which three flexible cables 200 ft. long extend to the bin. Transformers reduce the voltage in the job line to 2,300 and additional transformers at the bin step the voltage down still further to 440. The transmission system was relatively inexpensive, though the life of the project would have warranted a larger cost.

The general method of operation was suggested by the writer, who cooperated with Mr. Rae in the design of the installation.

Plan of Operation With Power Drag Scraper and Movable Truck-Loading Plant.



"NEW DEAL" PROBLEMS

+ In Operation and Merchandising

Dominate Mining Congress Convention

HOW TO MEET the changing conditions created by the "New Deal" and, at the same time, keep the coal industry marching forward was the dominant theme of the 11th annual Convention of Practical Coal Operating Men and National Exposition of Mining Equipment, held at Cincinnati, Ohio, May 7-11, under the auspices of the Manufacturers' Section of the Coal Division of the American Mining Congress. The effects of codes upon marketing and production and the problems created by the shorter work-day in bituminous mining played a prominent part in the discussions. Speakers representing both the anthracite and bituminous branches of the industry told what they had been and were doing to reduce costs and give the buyer a better product. Over ninety manufacturers had exhibits to show the operating men how their equipment fitted into the cost-reduction program of the industry (see pp. 234-241 of this issue).

Sounding the keynote at the opening session, speakers pointed out the progress already made and analyzed the future steps necessary to reap the maximum benefits possible from the new dispensation. The shorter work-week, declared Paul Weir, vice-president, Bell & Zoller Coal & Mining Co., further emphasized the need for mechanization. Both operators and manufacturers, he asserted, must work with their competitors for the common good.

All industries have new problems to conquer in the next few years, said Howard I. Young, president, American Mining Congress, and the time has come for throwing down the barriers between groups. While industry should not abandon opposition to the objectionable features of NRA, it should not lose sight of the benefits to be gained by getting behind the good parts of the program. This necessity for retaining the beneficial aspects of NRA, while eliminating the objectionable features, also was voiced by E. J. Newbaker, general manager, Berwind-White Coal Mining Co.; James F. Callbreath, secretary, American Mining Congress, and George R. Delamater, chairman-elect of the Manufacturers' Section.

Discussing the part played by the manufacturers in solving the problems of the industry, John T. Ryan, vice-president, Mine Safety Appliances Co., and retiring chairman of the Manufacturers' Section, in a paper read by Mr. Delamater, credited coal men with originating many cost-cutting, labor-saving and safety-promoting ideas. The manufacturers, he pointed out, have made a real contribution in maintaining facilities for conducting the necessary research and experimental work in developing these ideas.

Many managers keep mines operating at "a margin of profit" by cutting off development and maintenance during periods of depression, said Carel Robinson, general manager, Kelley's Creek Colliery. Rolling stock is run out on the scrap heap whenever major repairs are needed and headings are not driven as long as coal can be obtained from those already available. No attempt is made to show the owners that the mines are getting in such condition that large expenditures for development and repairs will be necessary to maintain tonnage.

At one mine, continued Mr. Robinson, the manager who kept up his development and equipment and could show only a loss was replaced by a sales manager who declared that he could save 5c. per ton. The latter man did this for some months by inroads on the plant which decreased capacity from 3,000 tons to 2,000 tons daily in less than a year and put the mine in such condition that $90,000 was needed to bring it back to normal. The owners thought they had saved $30,000 on the 600,000 tons mined during his régime, whereas they were really $60,000 out of pocket.

Another concern had a big contract and was working double shift five days a week. Costs naturally were low. But the manager foresaw short time and rising costs when the contract had been completed; moreover, he was letting heavy maintenance work slide because the company did not want to shut down the plant while repairs were being made. The situation was submitted to Mr. Robinson and arrangements made to debit the entire tonnage with a deferred maintenance charge of 3c. per ton, on which the manager could draw when the contract had expired and repairs could be made.

Where maintenance is deferred, concluded Mr. Robinson, the company should know it and should be prepared with money saved thereby to provide

---

C. M. Lingle, vice-president, Buckeye Coal Co., and national chairman of the program committee for the 1934 convention, was unable to be present at Cincinnati because of illness. The nine technical sessions of the convention were presided over by the following chairmen:

Paul Weir, vice-president, Bell & Zoller Coal Mining Co., Monday morning.

E. J. Christy, consulting engineer, Wheeling Township Coal Mining Co., Monday afternoon.

M. D. Cooper, division general superintendent, Hillman Coal & Coke Co., Tuesday morning.

C. W. Connor, general superintendent, Nellis Coal Corporation, Tuesday afternoon.

T. D. Lewis, general superintendent, Lehigh Navigation Coal Co., Wednesday morning.

L. E. Young, vice-president, Pittsburgh Coal Co., and C. W. Gibbs, general manager, Harwick Coal & Coke Co., Wednesday afternoon.

Eugene McAuliffe, president, Union Pacific Coal Co., Thursday morning.

F. F. Jorgenson, manager of production, Consolidation Coal Co., Thursday afternoon.

Robert J. Smith, president, Princeton Mining Co., Friday morning.

Ralph D. Taggart, vice-president, Stonega Coke & Coal Co., was toastmaster at the annual dinner, Thursday evening.

the funds for repairing the loss sustained by the mine. A manager should not be allowed to build up his reputation when he deliberately starves a mine; neither should he be discredited when he expends money to rebuild it. The speaker advised all managers to lay the situation before the presidents of their companies before undertaking to rejuvenate mines that were behind in development or repairs.

Eugene McAuliffe, president, Union Pacific Coal Co., declared that he had made profits during times of steady run which were in excess of those he could make in times of normal or subnormal activity. He urged the creation of a contingent fund which would enable the mine to show a more equalized operating margin in fair and foul times. The handicap of idle time discourages everyone.

A mining village cannot be called a "camp," because life there is not temporary, said William Beury, vice-president, Algoma Coal & Coke Co., who described himself as one of the third generation of Beurys to live in the town named after the founder. Despite a rising price level, he pointed out, there had been no advance in rents in the West Virginia mining towns. Housing and surroundings must not only be attractive to the many operators who live in these communities but must also attract the miners who naturally gravitate to the towns offering the most desirable living conditions.

Dawson, Ky., said W. H. Borries, mining engineer, Dawson Daylight Coal Co., used to be a stripping operation. Its possibilities in that direction being exhausted, a deep mine has been developed. The many houses now necessary have been placed on a gently contoured ridge which has been systematically beautified with attractive houses of varied appearance but common plan, set back 40 ft. from the road. Though naturally wooded, flowering and other trees have been planted, with box trees set at intervals between the sidewalks and roads. Septic tanks are provided for sewage. As far as possible, only Anglo-Saxons are employed, not from prejudice against others but to attain more rapidly a closely knit community.

Multiple shifting was advocated by F. S. Follansbee, chief engineer, Koppers Coal Co., to meet equipment costs by its more intensive use. He thought that 15 per cent more equipment would have to be available when working two shifts per day than would be necessary to produce half as much tonnage per day working on a single shift, because, with constant operation, there would be less time for repairs between shifts. Wear and tear would be greater. Closer inspection of equipment also would be necessary.

Mr. McAuliffe felt that multiple shifting met the problem of obsolescence by shortening the duration-life of the machine against its work-life. Invention and discussion had so rapidly changed machinery that the obsolescence factor in operation has become more important each year. A machine aged out before it wore out.

Broaden Mechanization Concepts

"MECHANIZATION" concepts, said G. B. Southward, mining engineer, American Mining Congress, should be broadened to include every tool, device or method to lighten the work of the miner or increase his productivity. Any backward step in mechanization would mean a major sacrifice in efficiency, with consequent higher labor costs and delivered prices. Mechanical loading is the last link in the chain putting industry in a position to apply machinery to all phases of mining.

Mechanical loading of slate in entries and aircourses has been so successful in reducing rock-handling cost and speeding up work at the Harwick Coal & Coke Co., declared C. W. Gibbs, general manager, that company officials would not like "to keep house" in the Thick Freeport (72-in.) seam without the machine. Necessity for grading entries and opening up aircourses led to the purchase of a No. 3 Myers-Whaley rock shovel in 1929. The first job undertaken was grading 3,700 ft. of entry on which rolls required grade changes of as much as 8 ft. With a shovel crew of two men, except when a third man was used to break up large rocks, 1,286 cars of rock was loaded out in approximately 60 days and new track was laid. The cars had a coal capacity of 3 tons. The shovel capacity for loading large lumps proved greater than the capacity of the chutes to handle the rock as dumped from the cars.

George R. Delamater

George R. Delamater, W. S. Tyler Co., was elected chairman of the Manufacturers' Section of the Coal Division, American Mining Congress, at Cincinnati, Ohio, May 9. He succeeds J. T. Ryan, Mine Safety Appliances Co., who was re-elected to the board of governors for three years.

Charles B. Officer, Sullivan Machinery Co., was advanced to first vice-chairman; Bruce G. Shotton, Hendrick Manufacturing Co., to second vice-chairman, and W. E. Goodman, Goodman Manufacturing Co., was elected third vice-chairman.

P. H. Grunagle, Westinghouse Electric & Manufacturing Co., also was reelected to the board of governors, and Roy C. Cox, Jeffrey Manufacturing Co., was chosen to fill the unexpired term of R. C. Becker, resigned.

During the first quarter of 1930, 1,375 cars of rock was loaded in cleaning 2,800 ft. of aircourse that had been used 20 years and contained many falls, most of which had been leveled as best could be by hand. Water gage dropped ½-in. after the cleaning. The machine also was used in cleaning and extending a sump which was too small. As a result, the pump is now operated only on off-peak hours.

Speed probably is the greatest advantage in shovel work. With hand loading, the maximum per man is three 3-ton cars and only three men can work at the face of a fall or roll in an entry, limiting hand loading to 9 cars per place per shift. The shovel crew averaged 20 cars per day and laid the track. In 67 working shifts, 2,360 cars were loaded. In a comparative test, the machine loaded 9 cars in 2¼ hours at a labor cost of 11c. per ton; power (½c. per ton), repairs (5c.) and interest and depreciation (4½c.) brought the total cost to 21c. per ton. Hand loading at a $4.76 day rate cost 46c. per ton.

If the rock shovel is successful in thick coal, remarked Robert G. Pfahler, mining engineer, Berwind-White Coal Mining Co., it is obviously necessary in the thin seams of Pennsylvania. A shovel was used in a thin-seam mine to clean up and enlarge 12,000 ft. of aircourse at a cost approximating $1.50 per foot, exclusive of charges such as power, interest and obsolescence. With hand labor, the work would have taken two to three years and would have proceeded too slowly to avoid installing a fan. A shovel crew of five men working nights averaged 49 cars (each equivalent to 1.2 cu.yd. solid material)

per shift and finished the job in less than a year. The cost of a tunnel driven with the shovel was $21 per yard lower than the lowest contract bid.

The Gunn-Quealy Coal Co., said G. A. Knox, superintendent, began mechanized mining in 1925. Mining conditions include a 6-ft. bed which pitches 10 to 15 deg., a fairly good roof for ordinary room-and-pillar work and a cover of about 800 ft. over the present workings. An irregular 1-in. parting is picked out at the tipple. Link-chain conveyors were first installed in a V-retreating system, which was soon abandoned because the conveyors were too heavy to be moved quickly. Longface workings were tried, but discarded because roof movement almost eliminated lump. After reverting to hand mining, shaker and drag conveyors were applied to room-and-pillar methods in April, 1932, and last year 171,000 tons was handled by this equipment.

All coal is now handled by conveyors. Vulcan shakers are used in rooms and, without moving, bring the pillars back. Entries also are driven by conveyors. A unit consists of four shakers in four rooms discharging onto a 400-ft. drag chain conveyor, which in turn discharges to a shorter drag at 90 deg. The latter carries the coal to the loading point on the parallel heading. Approximately 70,000 tons is loaded at one setting of the loading point.

An endless rope feeder operating at 50 ft. per minute handles the 22-car trips with the locomotive left connected to the trip. The motor crew changes from one locomotive to the other. During many half shifts, the main conveyor runs without a stop. This is made possible by providing approximately 4 to 5 tons storage near the discharge end of the main drag conveyor. Each shaker also has about ½-ton storage facilities near its discharge.

As the roof is tender, it falls before a great area is opened up. If, when bringing back a room pillar, conditions become alarming, the shaker conveyor is shortened and a new pocket is driven diagonally through the pillar, leaving a small stump. During the two years the present system has been used, recovery has been 90 to 95 per cent. Sections were first worked on the advance, but retreat has been found much more satisfactory. Sixteen loaders working on a set-up average 280 tons per shift.

If shooting on the shift were permissible and the roof could be held so that no squeezes would occur, remarked D. W. Jones, Valier Coal Co., such a system might be used in southern Illinois. Under existing roof conditions, however, there is too much danger of losing equipment concentrated in such fashion.

Mechanical loading with mobile machines is in its ninth year at the mines of the Chesapeake & Ohio Ry., said H. B. Husband, general manager of coal mining, and there is no question that it is safer, produces cleaner coal and is cheaper than hand loading. Seams varying from 5 to 10 ft. in thickness have been worked and as many as four partings have been encountered. These were eliminated by cutting. At an unnamed operation where both hand and mechanical loading are on a comparable basis, mechanical loading costs are 38 per cent less than for hand loading.

Mines of the Clearfield Bituminous Coal Corporation in central Pennsylvania are worked with chain conveyors on a room-and-pillar system somewhat similar to that described by Mr. Knox, said T. F. McCarthy, general superintendent. Scraper work on V-faces was started in 1924 and discarded in 1927 for chain and shaker conveyors in room-and-pillar work. The chain conveyor was made standard in 1930; last year about 50 per cent of the tonnage was so produced. Shakers are still used for development work. The coal—soft and friable—is 3 to 3 ft. 8 in. thick. The bed has no general dip but has local grades varying up to 6 per cent. Water accumulates in the dips. Gas is encountered in mining. On haulage entries, 2 to 3 ft. of top must be brushed. Rooms are driven 300 to 350 ft. long. One- to three-room conveyor units are used, but the two-room unit is most satisfactory.

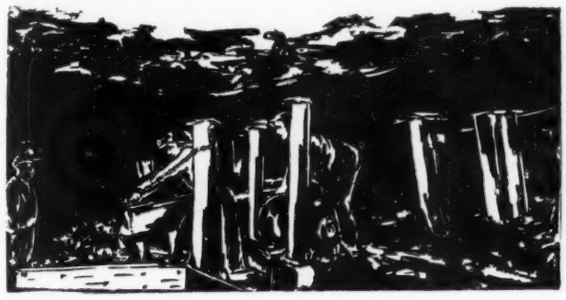
Eight mines of the Union Pacific Coal Co., said I. N. Bayless, assistant general manager, are now operating on a full-retreat room-and-pillar system with conveyors much like the method at the Gunn-Quealy mines. Pitches vary from 1 to 22 deg. and rooms are driven directly up the pitch. Equipment consists of 125 shaker conveyors. The Duckbill is the standard loading head. Recovery is 90 to 95 per cent of the whole seam. Production per face per conveyor is 60 to 100 tons per shift. The complete story of this system appeared in the April, 1934, issue of *Coal Age*, p. 125.

Eugene McAuliffe, president of the same company, added that the biggest factor favoring the method employed is the character of the roof. Once a break is started in extracting a room pillar, it follows well. In some places, totaling about 10 per cent of the district area, the roof is so frail, however, that forepoling over a 22-ft. crossbar must be used in driving rooms. With hand loading many rooms and pillars were lost because of the slowness of mining; now a room is driven up in three weeks and a pillar brought back in less time.

One of these mines operated from Jan. 1, 1932, to April 25, 1934, without a lost-time accident. Disputing the contention that old men cannot work safely around mechanical equipment, Mr. McAuliffe stated that his company so employs some men of nearly 50 years' service. Were it otherwise, the company would not be approaching 100 per cent mechanical mining.

Mechanization of the Mt. Olive mine of the Consolidated Coal Co. of St. Louis, said G. S. Jenkins, electrical engineer, started in 1926 with the introduction of pit-car loaders. Two years later a change was made to mobile machines and now the equipment consists of 26 Joy loaders. The coal seam is over 7 ft. thick. With hand loading, coal was taken to the fireclay floor, but with machine loading, 3 to 4 in. of bottom coal is left. Seven-ton storage-battery locomotives are used for gathering and 9-ton locomotives for relays. The saving in power demand pays for the batteries, so there is a gain through flexibility.

Rooms are driven 350 ft. deep and are turned on 52-ft. centers at an angle 60 deg. with the entry, so that cars can be pushed at high speed around the turn without derailing. The Joys operate in pairs, one on each side of a panel. One shortwall machine is used with each loader. The checkerboard system has been adopted with such suc-



cess that, whereas formerly 18 in. of top coal was left, this coal now is left only in every third room, which is the haulage room.

At the Gebo (Wyo.) mines of the Owl Creek Coal Co., the coal pitches 22 deg. and is moved down the working face by shaking chutes suspended by chains. This obviates the need for track, declared P. H. Burnell, superintendent. A small hoist is used to pull material up the inclination. Rooms are 250 ft. long and 25 ft. wide, with 25-ft. pillars. The complete story of this development was published in the April, 1934, issue of *Coal Age*, p. 125.

New Wrinkles in Face Operation

USE of a Joy coal saw in the Pocahontas No. 3 bed at the Helen mine of the C. C. B. Smokeless Coal Co., said Albert Evans, division engineer, increased lump percentage 8.31 and egg percentage 4.78, while decreasing stove percentage 3.01; nut, 4.40; and slack, 5.68 per cent. Figures cited are differences between percentages of the entire product obtained with the saw and the percentage of the entire product obtained with a shortwall machine and show actual, not relative, improvement. The seam is 44 to 48 in. thick and consists of the following benches from the top down: coal, 4 to 7 in.; bone, 8 to 10 in.; coal, 24 to 28 in.; bone or coal, 5 to 6 in.

Working in the No. 4 seam at the Stotesbury mine, consisting of 32 to 42 in. of clean coal surmounted by 6 to 8 in. of rash and drawslate, which is gobbed by the night crew, the saw increased lump 8.75 per cent and egg 3.58 per cent. Nut decreased 0.32 per cent and slack 12.01 per cent. Comparative time studies in loading after the saw and the shortwall machine are set forth in Table I.

Table I—Time Studies in Loading After Saw and Shortwall Machine

Operation	Coal Saw Helen Time in Minutes	Coal Saw Stotesbury Time in Minutes	Shortwall Machine Helen Time in Minutes
Tramming	7.32	5.78	5.48
Cutting	26.69	27.37	18.07
Changing chain or bits	1.17	0.32	0.72
Total per place	35.18	33.47	24.27

The coal saw, continued Mr. Evans, will cut 25 places per 7-hour shift if only one shearing and one horizontal cut are made. Maintenance costs, including lubrication, minor repair parts, labor and two breaker pads at $25 each which were broken in experimental work at Helen, have been less than $100 since May, 1933; during that period 6,300 tons was cut with the saw. Power requirements approximate the same as those of a shortwall machine with a 7½-ft. cutter bar, but because of the additional length to be cut, the power bill for the saw is about doubled. Bits need tipping with "Stoodite" every 4.1 cuts in one mine and every 4.5 cuts in the other. Repairs to the bits seemed to depend largely upon the skill with which the Stoodite was applied. No chains were broken.

Many shots fail to fire and do their required work, said Pearl Bassham, vice-president, Harlan-Wallins Coal Corporation, in a paper read in his absence by J. F. Bryson, safety director, Harlan County Coal Operators' Association, because cartridges are allowed to stay in storage or in the mines too long before use. Some cut sticks are left over, and these deteriorate rapidly. Before machine undercutting, men were accustomed to straighten up their faces, but now faces are likely to be irregular.

Machine men can cut the ends of the kerf square if they will take the time and trouble. Management must decide definitely whether it wants maximum performance from the cutters or a good, workmanlike job. If management does not insist upon the latter, the rib will be a series of offsets and shooting will have to be heavier. Most cutters do not realize that gouging or "gripping" the rib is bad practice. If they are going to gouge, the outer holes should be directed toward the rib at the back of the cut. It is better, however, to make a square cut and put the outer holes parallel to the sights. The holes should not penetrate the coal as far as the undercut.

Air-spacing is more helpful in thin than in thick coal, said Mr. Bassham. In thick seams with a single row of holes, more violence is needed and is permissible. Only one shot should be fired at a time, and all the coal from one shot should be loaded before another is fired. Adequate drill diameters must be provided. Cartridges of small diameter will not serve as well as air-spacing for cushioning shots. Any cut cartridges should be put in the back of the hole. Bug dust should be cleared out of the cut. No mechanical spacing is provided in front of the explosive charge in Harlan shooting. The first stemming dummy is put in without tamping and the rest of the dummies are tamped in tightly.

To make sure the coal will come down, remarked J. M. Johnston, chief engineer, Bell & Zoller Coal Mining Co., miners almost invariably use too much explosive and so break the coal excessively. Fortunately, with Cardox, the strength of the breaking-down impulse is determined by the man who fills the cartridges, and he follows instructions. After much training of men who do not realize the importance of a square cut, his company is now getting straight faces. Time studies and screen tests are valuable in shooting.

Development of horizontal drilling for shooting overburden in open-pit work at the Oakland City (Ind.) mine of the Enos Coal Mining Co. was described by C. R. Barnard, chief engineer. The drilling is done with a Sullivan "Stripborer" traveling on the top of the coal and equipped with a 6-ft. vertical adjustment for placing holes at the most advantageous height above the coal. Average thickness of overburden is 36 ft. Holes are bored 40 to 85 ft.

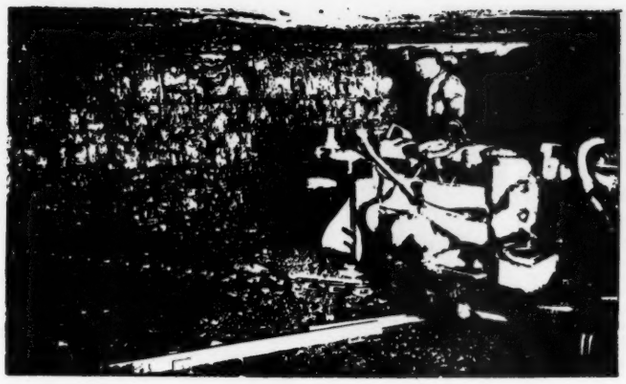
Drilling is in a stratum of gray slate. In this material, the average production per borium-tipped bit is 150 ft. Drillings are used for stemming the L.O.X. explosive. Considered from every angle, declared Mr. Barnard, horizontal drilling is cheaper and, due to the 100-per cent effective lifting action of the charge, less than half the quantity of explosive is required as compared with vertical holes and charges. A detailed story on Enos drilling practice was published in the March, 1933, *Coal Age*, p. 85.

Horizontal drilling unquestionably has brought about extraordinary savings in drilling and shooting costs, said J. B. F. Melville, Electric Shovel Coal Corporation. It has cut these costs in half at the Ayrshire mine at Oakland City, where one machine was installed a year ago. To avoid shattering, the explosive should be placed at least 3 ft. from the coal.

Advantages and limitations of "Gunite" for roof control in the Pittsburgh seam, where disintegration due to slacking is common, were outlined by C. E. Hough, engineering department, Federal Coal & Coke Co. A coating of Gunite of ordinary thickness assists roof control by sealing the strata from the air, but is not a means of roof support. Guniting is not adapted to places where there is any roof action to break the seal and is recommended only where proper sealing will eliminate the development of a need for roof support.

The accepted method of Guniting is to apply a thin coat of neat cement and follow this immediately with a cement mortar consisting of a 3 to 1 mixture of cement and dry sand. The proper thickness is about 1 in., applied in two coats, with the first about ¼ in. It is best to do this work in the winter when the tunnel surfaces are dry. Gunite was first used at Grant Town about seven years ago in a barn near the shaft bottom. Next a short manway was treated.

Only if coal is quite friable is it necessary to coat all the rib. In harder coal, 2 ft. down from the top is sufficient coating to keep air from attacking roof strata. A coating of 4 to 6 in.



will provide roof support, but, if support is needed, treated-wood timbering is preferable. In most cases, Guniting is cheaper than permanent timbering. For a 1-in. coating, the average cost is about 10c. per square foot.

Failures of Guniting, due principally to inexperience and improper preparation of the places to be treated, observed John H. Richards, chief mining engineer, Hanna Coal Co., create an unfavorable impression in the minds of management which can be offset only by counter examples of success. Such an example he found in a haulway in eastern Ohio that had been Gunited several years ago and was holding in good condition. In that section, the top coal gradually comes down, allowing air to get to the 6- to 8-in. strata of shaley material, which slacks rapidly. Unless this slacking is checked by Guniting, continued sloughing off of roof and ribs may widen an 8-ft. entry to as much as 12 ft. during the years it is used. Making a safe haulageway is another advantage of Gunite protection. The life of an entry must be kept in mind, however, because, if it is to be used only four or five years, the top coal may hold well enough to negative any net saving by Guniting.

Natural measures, said George S. Rice, chief mining engineer, U. S. Bureau of Mines, are strong before they weather and Gunite will preserve this strength if pillar support is sufficient to prevent weight riding over and cracking the coating. A failure due to unusual natural conditions was described by C. W. Connor, general superintendent, Nellis Coal Corporation. In 1929, about a mile of entry in the Nellis mine was cleaned up and Gunited, but, due to the "slickenside" surface presented by some of the top slate, areas of the Gunite soon fell off. Repaired patches would not hold, so further use of Gunite was abandoned. Coating applied to sandstone and shale adhered very well.

An experienced man is needed at the nozzle of the cement gun to judge whether the mixture is just right, explained Mr. Hough. Both quick-setting and ordinary cement have been used, and little difference was noted.

With day-wage operation of undercutting machines, said D. D. Wilcox, general superintendent, Superior Coal Co., the industry has been released from the differential established when the puncher pick was standard. As a result, large savings can be made by the use of mounted cutters which operate directly from the track and need no chains and no jackpipes except to keep the track from slewing. At the Superior mines, each machine cuts for 27 pit-car loaders and easily could cut more. The record day's cutting is 1,200 tons, but 900 tons is more nearly the average required. This compares with 70 tons for the old puncher machines, 170 tons for breast machines and 300 tons for shortwall cutters.

When cutting near the bottom, the bar must be lowered to the required level and raised again before the cut is made. If, in bottom-coal cutting, the bar is sprung, the runner will not note it in time. In the Superior mines, the bottom usually has impurities, so it was decided to cut in a clean band 30 in. from the floor. This reduced cutting time from 12 to 15 minutes. The face, however, requires more explosives because of the shift in the cut; drilling and shooting practice had to be revised and the floor was not as smooth for shoveling. A rounded kerf seems to make shooting easier. Repairs, lubrication, bits and renewals for nearly 2,000,000 tons and four machines average 2.8 mills per ton—about one-fourth as much as for shortwall machines. The mounted cutter uses 5.9 to 6.8 kw.-hr. per working face; the shortwall, 7 to 8 kw.-hr.

Absence of undesirable gases, an unshocked and, therefore, safer roof, and more lump coal are among the advantages of "air shooting" cited by C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri. Moreover, with air shooting, the coal can be brought down during the working shift in places where the law prohibits the use of explosives during that period. Equipment for the latest development in air shooting is described on p. 241.

Supplementing Mr. Sandoe's paper, Fred A. Miller, Franklin County Coal Corporation, where the Energy air-miner was developed, stressed the safety features, the larger percentage of lump recovered and the better moving of the coal from the face in the breaking-down action. The product, he said, also was less subject to degradation. For the other side of the ledger he mentioned additional capital investment, introduction of another piece of equipment to maintain and complication of drilling because of the large holes required.

Tests at the Royalton mine of the Franklin company in southern Illinois indicate an increase of 26 per cent in sizes above 2 in. and a decrease of 22 per cent in minus 2-in. coal. The plus 6-in. coal was more than doubled. The mine has a daily capacity of 3,000 tons: about half the output is shot with powder and hand-loaded; about 80 per cent of the remaining output—all machine-loaded—is air-broken. Air shooting costs, he said, compare favorably with those for powder shooting. Not as many holes are used with air mining. At Royalton, two men, as in powder shooting, keep one loading-machine unit in coal.

Transportation Gets Right of Way

LARGER CARS become imperative with long hauls and mechanical loading, asserted I. N. Bayless, assistant general manager, Union Pacific Coal Co. Time studies at his operations showed that in mechanical loading one car could be replaced by another in 1.3 minutes and that, when the machine loaded coal at a speed of 45 tons per hour, a 1-ton car would enable the loading machine to work only 50 per cent of the time, whereas with a 4-ton car it could work 80 per cent of the time.

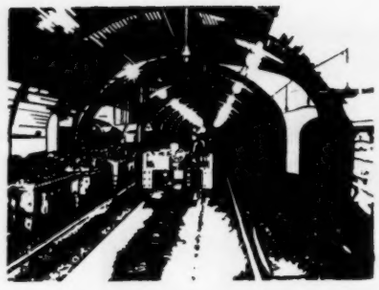
The industry loses a "good" hour under the shorter work-day. The first and last hours of a shift are of little value, so, instead of having six "good" hours, there are now only five, said E. H. Jenks, division engineer, Rochester & Pittsburgh Coal Co. Increasing locomotive size and size of trips increases peak loads and makes larger feeder lines necessary. With good rails and track, wrecks can be eliminated. Active men are needed as track hands; they should go to their work with a tool car and a locomotive; the locomotive headlight will serve to line the track.

Small mine-car repairs, bolts loose or lost, etc., should be made on the tipple to save time. Dispatchers using telephones should control all movement except that of the gathering locomotive

after leaving the inner parting. A record should be kept of all cars in the repair shop. Sometimes as much as $4,000 worth of cars will be in the shop awaiting repairs. By moving men around from well-filled sections to lighter sections, mine foremen can help the dispatcher in his car distribution and gathering problem.

In the anthracite region, the problem of furnishing cars at the face to mechanical units, especially in crushed ground where scrapers are being worked on three adjoining pillars, has many disturbing difficulties, declared Hugo Nyquist, engineer, Hudson Coal Co. Where loading is mechanized, less haulage equipment and rail are needed, asserted R. J. Oldham, superintendent, Centralia Coal Co. A large saving is made by using treated timber. Just enough cars to service the mine should be regarded always as an inadequate supply. Dispatching at Centralia has been reduced to its simplest terms: no dispatcher is employed; as the trip leaves for the bottom, the brakeman reports the number of cars and a trip of the same number is made up for the return journey so that the locomotive will lose no time.

The importance of concentration for economical gathering and of proper coordination between gathering and loading was emphasized by J. H. Richards, chief mining engineer, Hanna Coal Co. In support of this thesis, Mr. Richards presented a tabulation showing that, with proper concentration, locomotive haulage is much preferable to animal power. For purposes of comparative



study (see Table II) the cost of gathering per ton at Mine *A* has been equated to 100 and the costs at Mines *B, C* and *D* have been multiplied to bring them to proportionate figures. Except for the motive power, conditions in Mines *B* and *D* are similar; in both cases, the car used has a capacity of 2 tons level full. Mine *C* cars have a capacity of 4½ tons level full.

Table II—Relative Costs of Gathering Haulage in Hanna Mines

Mine	Total Tonnage Hauled	Percentage Cost in Terms of Highest	Haulage Unit
A	762,739	100.0	Animal
B	475,725	91.4	Animal
C	506,750	87.4	Locomotive
D	226,327	59.0	Locomotive

Diesel locomotives are being used underground in German mines and are found both efficient and safe, said George S. Rice, chief mining engineer, U. S. Bureau of Mines. Tests also are being made in England, France and Belgium. Mr. Rice voiced the hope that these locomotives might find a place in American mines.

Where the Customer Is King

WHAT is being done to improve preparation and to balance consumer preferences against the cost of meeting his requirements had a prominent place at several of the technical sessions at the Cincinnati convention. With prices higher and definitely set by code authority, quality, declared E. J. Kerr, combustion engineer, Lorain Coal & Dock Co., becomes more necessary than ever if the cost of making power is not to increase unduly. Coal in its relation to the individual consumer's plant must be studied carefully.

With some pulverized-coal installations, he continued, an increase in moisture decreases the capacity of the pulverizer, but many plants have such efficient drying facilities that a reasonable quantity of water causes no difficulty. Most coals high in inherent moisture are free-burning, so moisture interferes little, if at all, with combustion. Introduction of water-cooled and air-cooled furnaces has put coals with low-fusion-temperature ash in a less unfavorable position; with slagging furnaces, the consumer actually discriminates against high-fusion-point coals.

Too much reliance should not be placed on laboratory figures in deciding on clinkering characteristics; behavior in commercial combustion is what counts. Proper sizing and selective mining may enable the operator to give the user a coal with the required burning characteristics. But code prices should recognize the extra costs thus involved. Experience shows that the operator gives an analysis that perhaps truly represents the average of the best third of his coal. As uniformity is what is wanted, even the average of the entire product does not give the precise information required. A daily check of the coal is essential, with sampling that is accurate and analyses that are reliable.

The consumer, said Mr. Kerr in answer to a question, sometimes found that a lower ash content increased the cost of stoker maintenance. He had observed some cases where coal treating had improved performance and modified burning characteristics. He hoped he was not "kidding himself." Treating did not, he thought, reduce clinkering but did reduce objectionable clinkering such as adheres to grates and walls.

General conclusions as to the relative values of wet and dry cleaning by specific-gravity methods, asserted T. W. Guy, consulting engineer, are confusing because some devices serve one coal better than another. If only 60 to 70 per cent of the impurities are to be removed, either method of operation seems equally good. But a plant which is 100 per cent efficient at a high gravity may be only 19 per cent efficient at a low-gravity separation. Mr. Guy based his efficiency determinations on the U. S. Bureau of Mines formula—i.e., the ratio between washing efficiency and float-and-sink test.

Some methods seem able to clean down to low gravities with little relative loss of efficiency; with others, the decline is quite rapid. With a given type of equipment, efficiencies vary little with different feeds. As it may cost two or three times as much to make a 6-per cent ash separation as a 7-per cent, the producer should be sure he can get enough more for the 6-per-cent-ash coal to pay him for his effort. Uniformity of product, declared Mr. Guy, cannot be overstressed. Better a coal with 1 per cent more ash than a coal that is now high and now low in ash, so that burning conditions must be constantly readjusted to suit the fuel. Washed coal is more uniform than dry-cleaned coal, yet some dry-cleaning plants give great uniformity. Wet washing improves appearance.

In screening Pocahontas coal, said A. F. Castanoli, preparation manager, Koppers Coal Co., the average results are as follows:

Screen Percentage	Size Inches	Ash Content Per Cent
21	½ × ¼	8.1
79	¼ × 0	4.8
100	½ × 0	5.3

Sink-and-float tests on ½x¼-in. pea give 93.8 per cent float at 1.45 sp.gr. and 2.7 per cent sink at 1.60 sp.gr. Washability curves show that Pocahontas pea can be cleaned to 5 per cent ash with a reject of only 5.2 per cent. In other regions, the fine coal is the dirtiest received by the preparation plant. With wet washing, the ash content of Pocahontas slack can be cut 0.7 per cent—i.e., it can be loaded with only 4.6 per cent of ash.

When ½-in. sludge with about 16 per cent moisture is loaded in separate hopper cars, its water content will drop to 5.3 per cent in about six days; thereafter drainage will make little difference. Dry slack or fine mine-run in time will absorb up to 3 per cent of moisture and wet ½-in. slack does not take long to reduce its moisture below 5 per cent. If ¼-in. sludge—even when quite wet—is mixed with dry slack of the

same size, after six days the moisture content of the mixture will not exceed that of the dry slack by more than 1 per cent. Only by prescreening can the quantity of sludge be kept to a minimum. In Pocahontas coal, sludge should be held to 4 per cent of the mine-run if best results are to be obtained when 4x½-in. coal is washed.

Wet processes, stated Mr. Castanoli, give higher operating efficiencies, lower initial and lower operating cost than dry processes. The latter require more power in cleaning large sizes, but, on the other hand, costs decrease when smaller sizes are being treated. Less attendance is needed for wet cleaning; in some wet plants, control is automatic and part of the control is inherent in the equipment. Emphasis on the advantage of dry cleaning begins to assume importance when fine coal must be dried by heat where no flue or other gases are available for the job.

Uniformity is one of the major requirements, declared J. W. Wilson, McNally-Pittsburg Co., indorsing the statements of Messrs. Guy and Kerr. Raw coal, he said, always is uncertain and has inherently difficult burning conditions. Water adds to weight just as ash, insisted Edward O'Toole, American Coal Cleaning Corporation, and the energy of the fuel is consumed in expelling the water. Wet washing is at least 100 years old in the industry, while dry cleaning is comparatively new. Give the latter a chance to demonstrate its advantages, Colonel O'Toole urged.

Because anthracite consumers have been educated to prefer bright coal, large quantites of dull coals have been left in the refuse banks and formerly bright coal in these same piles has been discolored by iron oxides leached from the slates. These coals, explained T. M. Dodson, vice-president, Weston Dodson & Co., can now be restored to their original luster by a scouring process (see *Coal Age*, February, 1934, pp. 44, 50) which is equally applicable to pillar coal and to coals near outcrops.

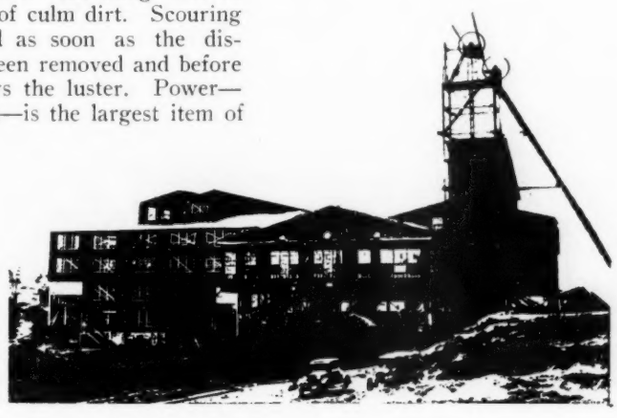
To crack dull coals to smaller sizes for the purpose of presenting two or more bright faces means a decrease of $2.75 per ton in sales realization. The Dodson process, which avoids cracking, uses sprays of water containing 20 to 30 per cent solids of culm dirt. Scouring must be stopped as soon as the discoloration has been removed and before abrasion destroys the luster. Power—4 to 5c. per ton—is the largest item of cost in operating the scouring machine; maintenance approximates 1c.

R. E. Hobart, mechanical superintendent, Lehigh Navigation Coal Co., who agreed with Mr. Dodson that anthracite did not deteriorate in storage, said that he had observed a vast difference between the raw feed and the scoured product. He saw little application for scouring in bituminous, however, principally because bituminous consumers have not been prejudiced against dull and discolored coals. In only one out of nearly fifty tests, observed B. H. Stockett, general manager, Weston Coal Co., did they feel that scouring had not resulted in at least a 75 per cent improvement. Anthracite discolors quickly—in some cases even while in the railroad car. With the scouring machine, coal stored indefinitely can be restored to original brightness.

R. E. Kirk, general superintendent, Mahanoy district, Philadelphia & Reading Coal & Iron Co., thought that bituminous coals would not stand the action of the scrubber. Moreover, material comparable in abrasive action to the culm dirt is not so commonly available in the bituminous districts.

Wet cleaning of small sizes of anthracite at the operations of Pardee Bros. & Co., Inc., has proved generally satisfactory, according to B. C. Osler, general manager, in a paper read by John Griffen, Koppers-Rheolaveur Co. Since the installation of a Koppers-Rheolaveur unit in April, 1932, only minor repairs have been necessary and only one man is required to operate the cleaner. Until June, 1933, this unit was confined to rice and barley. Because some difficulty was experienced with the light, flaky slates in the buckwheat sizes, it was decided to try to wash the buckwheat in a free-discharge unit. The quantity so washed has been gradually increased and approximately 50 per cent of the buckwheat now goes through this separate unit. The average weighted percentage of ash in the small sizes has been reduced from over 20 per cent in the raw feed to 11.56 per cent in the washed product.

Provided the unit is not overloaded, explained Mr. Griffen in response to questions, it will operate with good results on raw feed with wide variations in ash content. If, however, the quantity of refuse in the raw feed is materially increased, the capacity of the unit is reduced. A higher percentage of fines, he said, does not affect the efficiency if the washer is kept within its capacity for that particular type of feed.



Too often sampling of coal, which should be a major objective in the design of a preparation plant, is treated as an afterthought, asserted D. A. Russell, chief chemist, Youngstown Sheet & Tube Co. At Nemacolin, however, mechanical sampling was built into the washer and almost all its details were arranged concurrently with the design of the plant so as to make sampling both inexpensive and representative of the entire 4x0-in. feed to the washer. A certain proportion of the coal delivered to the washer is taken for sampling and fractionated automatically. This fraction is retained in a small bin for analysis.

Sampling correctly is no easy matter, declared M. H. Forester, preparation manager, Consolidation Coal Co. Unless the chemist carefully trains his personnel, he will not get representative samples. The purchaser has equipment of a certain type which has been set for definite percentages of ash and sulphur and the equipment will not function properly if these percentages are changed. Unfortunately, coal in place is not uniform throughout the seam; sulphur may vary from 0.5 to 7.0 per cent; fusion temperature of the ash, from 1,900 to 2,900 deg.; the character of the ash, too, varies. The seam also may show marked changes from one section of the mine to another. Some areas may have less than 1 per cent sulphur and be salable as metallurgical coal; other sections may have 2 to 2.5 per cent and be marketable only as steam coals.

One need not sample each car or every day's run, said Mr. Forester, but the highs and lows must be known. Knowing—in fact, dictating—the system of mining both as to places worked and the number of men in places, knowing how the faces are being operated and controlling the mixing of bug dust with the shot coal, the ash percentage should not vary over 15 per cent from normal in short runs. Samplers should prepare the places for their channel sections, sweeping them clear of all mine and rock dust. When they take a sample, they must avoid taking in roof or floor material.

Automatic sampling may be incorrect, continued Mr. Forester, because it may include too much large or too much small coal. Hand sampling may have a similar defect. Certain characteristic irregularities also may exist and the sampler must be duly warned of their presence. About 250 lb. should be

taken from a 50-ton car. Turning to costs, he said that a simple proximate analysis of 225 samples taken from 475,000 tons had cost $2.75 per sample, or 1.3 mills per ton; in another case, 2,000,000 tons was sampled and a complete analysis, including fusion temperature of ash, was made at a cost of $4.42 per sample, or 1.6 mills per ton.

All tipple processes from dumping onward, said A. F. Nesbitt, consulting engineer, result in the formation of much dust. He suggested a system of pressure and suction ducts for removing the fine dust either in the coal as it comes from the mine or broken from it in handling. Preparation at the No. 4 mine of the Pond Creek Pocahontas Co. (described in the April, 1933, issue of *Coal Age*, p. 118) was the subject of a paper by F. C. Carothers, assistant to the manager.

Illinois' first central cleaning plant, built by the Universal Coal Washing Co. at Pinckneyville, was erected to meet the growing demand for a clean and properly prepared stoker coal, said Walter E. Rutledge, vice-president, Binkley Coal Co., in a paper read by C. F. Hamilton, vice-president, Binkley Mining Co. It is the intention of the plant to handle coal from any mines which may desire to employ its services, and milling-in-transit rates have been established from a number of operations. Equipment consists of a Norton two-primary and three-secondary stage wash unit with automatic refuse-discharge control. Capacity is 125 to 140 tons per hour. Because the plant is independent of mining operations, it can be multiple-shifted. Hourly capacity also can be doubled by adding another wash unit and dewatering screens.

An open launder ahead of the washer, through which coal is hydraulically flushed into the washer, provides proper wetting and mixing. The classifying screen is designed to make three sizes between $\frac{3}{8}$ and $1\frac{1}{4}$ in. Sizes can be mixed. The $\frac{3}{8}$-in. size passes under fresh-water sprays on a dewatering screen. Slurry from the dewatering screens goes to a settling tank and the sludge then passes over $\frac{1}{8}$- and $\frac{1}{4}$-mm. wedge-wire screens, where the coal is recovered. The plant arrangement is such that the washer can be bypassed and the coal stored and later recovered for treatment.

Mr. Hamilton expressed the opinion that in a few years the greater part of all minus 2-in. southern Illinois coal will be prepared in central plants. The Universal cleaner, he said, can handle coal up to 3-in., but at present is cleaning only the minus 2-in. product.

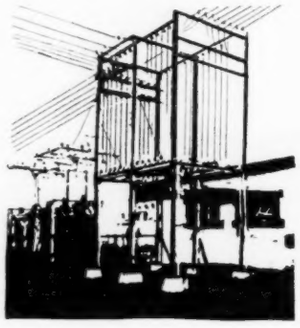
High Power Costs Spell Waste

ELECTRICAL EXPERTS came forward at the Cincinnati convention with recommendations for reducing power costs which ranged from a complete check-up of the entire mine-distribution system to such individualized suggestions as the use of old storage batteries as floating equalizers and the replacement of obsolete ventilation equipment. Except as some of the recommendations made might be equally applicable to private power plants, the discussions all revolved around the economic use of purchased power. The question of central station vs. private plants was not debated.

Eight methods for increasing efficiency in using power were set forth by M. W. Horgan, mining representative, Monongahela West Penn Public Service Co.: (1) scheduling, (2) power-factor correction, (3) relocation of substations, (4) use of demand limiters, (5) ventilation improvement, (6) improvement in drainage conditions, (7) revision of electrical layouts, and (8) survey of town lighting.

Scheduling reduces the load factor by spreading the mine load as far as possible over 24 hours and thereby lowers the demand charge. The possibility of eliminating overlaps in operations using power should be investigated. Poor power factor is costly, because it means overloading lines and transformers and poor voltage regulation. Most authorities set 300 leading reactive kva. capacity as the dividing line between the installation of a capacitor and a synchronous condenser for power-factor correction. Synchronous motors should be kept fully excited.

One mile is the limit set by many large operators for transmission of direct current (voltage not specified) and 20 per cent as the allowable voltage drop. Demand limiters generally will pay for themselves in less than a year, but they are not a cure-all for high power bills. Limiters are helpful in cutting maintenance costs and in educating motormen, pumpers and cutters on the effect their machine load has on the mine load.



An annual check on ventilation was advocated. Points to be scrutinized are: (1) suitability of motor type and size to fan, (2) efficiency of fan, (3) suitability of fan for mine, (4) equivalent orifice of the mine, (5) efficiency of drive connection, and (6) voltage conditions. Plugged pipe lines and pumps no longer efficient for the duty cause high pumping costs. Revision of electrical layouts was stressed from the standpoint of the condition of d.c. electrical conductors, including bonding and portable cables. Metering houses will tell the operator whether he is recovering the cost of the service.

Based on a 7-hour day and 200 working days per year, the load factor of the working-shift loads, such as hoisting, loading, machine, haulage and tipple operation, said Carl Lee, electrical engineer, Peabody Coal Co., is but 16 per cent. Only such loads as cutting, pumping and handling supplies lend themselves to spreading. Power factor is more important to the power company than to the customer unless rate schedules carry bonus and/or penalty clauses. Mr. Lee questioned the one-mile limit; under certain conditions of size and distribution of load and of working days per year, it might pay to transmit direct current two or three miles. The practicability of limiters depends upon interrupting the very loads which must be operated during the working shift, and this is not very attractive under the 7-hour day. The drive to effect savings in ventilation by installing more efficient fans has just started; reductions of 30 to 40 per cent in yearly power costs frequently follow ventilation-equipment changes.

As a check on drainage power costs, C. C. Ballard, chief electrician, New River Co., recommended testing pumps for power consumption and performance and pipe lines for undue friction. At some mines in his district, pumping absorbs 20 to 30 per cent of the total power requirements. Pump motors should be equipped with meters. He felt that power factor was important to both the power company and the consumer. Mr. Ballard conceded the value of limiting the voltage drop to 20 per cent, but favored setting the goal at 10 per cent.

With credit allowances on old batteries down to scrap value under the battery manufacturers' code, W. Van C. Brandt, Electric Storage Battery Co., suggested using such batteries to float on a d.c. line to take peaks off the generating apparatus. Although an old battery may have insufficient capacity for haulage and cutting, it still has a tremendous capacity for handling short peaks and might prove valuable as a peak-load limiter. Batteries have been used with marked success for demand smoothing, added J. H. Edwards, associate editor, *Coal Age*, who cited the case of a West Virginia operation that installed a new 250-volt battery inside

the mine as a floating equalizer instead of moving a substation, because the mine would be worked out in a few years. As a result, substation capacity was increased and voltage regulation at the load center improved; demand was reduced 30 to 40 per cent and energy consumption per ton was cut by reduction of peak current through the main circuit from substation to load center.

To reduce transformer costs, said W. H. Lesser, James H. Pierce & Co., he had used three three-phase transformers to form a bank instead of three single-phase transformers, so that one or two of the transformers could be disconnected from the banks when loads were light. A. E. Lee, consulting engineer, stated he had found instances where carrying full field current in a synchronous motor during short periods when power-factor correction is not needed is costly. He is now applying automatic field control to the synchronous motor of a mine fan.

Too many companies are reluctant to scrap a fan and install a new one suited to the mine if the operation is to be worked out in three or four years, said W. L. Affelder, vice-president, Hillman Coal & Coke Co. But that, he insisted, is just the time to act so that the new installation can pay for itself and allow the operator the profits in the remaining life of the mine. His company has replaced old fans with new ones in four mines; the cost was or will be returned in six to ten months.

Is Safety Imperiled by New Deal?

FEAR that unionization may have a retarding effect upon accident-prevention work crept into the discussions of safety at the Cincinnati convention. F. S. Lenhart, safety director, W. J. Rainey, Inc., with a record of 495,025 tons per fatality from 1916 to 1933, asserted that indifference had replaced enthusiasm since the union won control. Attempts at discipline, he added, merely resulted in a walkout. C. W. Gibbs, general manager, Harwick Coal & Coke Co., however, pointed out that the new wage agreement made specific provision for discipline; moreover, a representative of the local union had attended a company safety meeting and indorsed his company's safety regulations in no uncertain terms.

Apprehension that safety will suffer unless local union officials really back the declarations of their national organization and make safety a union activity also was voiced by C. F. Keck, mine inspector, Jamison Coal & Coke Co. Petty arguments, he maintained, must be laid aside and both management and men must realize that the code is intended to be mutual in its application and in its benefits.

While not charging that work cannot be done as safely under the code, Mr. Keck was convinced that many new hazards have been introduced. At some mines, men have refused to attend meetings of the Holmes safety chapters. Pay by weight instead of by car has increased car loadings to the point that spillage on tracks is creating a dust hazard difficult to control. The new conditions, however, have lessened the financial worries of the workers and this is a gain for safety.

W. L. Affelder, vice-president, Hillman Coal & Coke Co., also felt that there had been some letdown in safety under the code. In some cases, restrictions have been imposed against complying with certain regulations, particularly with respect to protective clothing. The code permits reasonable safety regulations, but what is "reasonable" naturally is a matter of judgment.

Fortunately, more specific regulations are included in the new wage contracts in the Pittsburgh area, because local leaders of the United Mine Workers are sold on safety work. Operators may require the use of safety hats, shoes and goggles, but must sell such articles to

the men at not more than 10 per cent above the wholesale cost. Mr. Affelder urged all districts to seize the first opportunity to incorporate a safety clause in new agreements more clearly defining "reasonableness."

In the anthracite region, said C. G. Brehm, supervisor of safety and compensation, Susquehanna Collieries Co., all kinds of protective clothing are in use. Eighty-one per cent of the underground employees have protective hats. Less than 50 per cent of the men, however, now wear goggles, but they are gradually beginning to recognize the value of this eye protection. All Susquehanna underground workers, including officials and inspectors, wear protective hats and goggles. Safety shoes are slowly but steadily gaining ground. Many thousands of gloves are in use; his company alone has sold 13,000 pairs.

Many miners working in dusty coal are beginning to realize that they end the day's run feeling fresher if they have worn respirators. Protective clothing, added Mr. Brehm, usually is sold at cost. Operators prefer to sell the equipment their men wear because they then are assured that the devices used will function properly. "Safety clothes make a man safety conscious."

Safety, said J. F. Bryson, director of safety, Harlan County Coal Operators' Association, returns dividends equal to those on any other investment. Accidents absorb about 10 per cent of the mining costs at operations which have given only ordinary attention to mining hazards. What can be accomplished by close attention is demonstrated in the records of declining compensation costs at five Harlan mines (see Table III).

Table III—Comparative Compensation Costs: Harlan County

Mine	Cost in Cents per Ton 1928	1933
A	5.3	0.6
B	6.5	0.5
C	6.0	0.9
D	6.0	0.3
E	2.5	0.5

Without harmonious relations and good feeling, stated William Roy, Jr., reading the paper of his father, William Roy, Sr., safety director, Hanna Coal Co., safety cannot be attained. Basic rates for insurance in Ohio run $9.50 per $100 of payroll for companies not self-insurers and range between $4.75 and $18. The cost at Hanna mines in 1928 was 63c. per $100 of payroll and 7.6 mills per ton; in 1933, it was 41c. per $100 of payroll and 2.7 mills per ton.

Men should not receive compensation if they violate the law, asserted J. J. Rutledge, chief mining engineer, Maryland Bureau of Mines. In his State, costs run from 8 to 12c. per ton, but some companies who follow safe methods pay only 1½ to 2c. Accident repeaters are a great source of expense and should be separated from the payroll. A broken car wheel on a plane caused a fatal accident, and since that time safety ropes have been required on all planes, although such accidents are infrequent.

In 1927, said a paper by O. V. Simpson, safety director, Alabama By-Products Corporation, Alabama had 93 fatalities, or one for every 217,106 tons. An intensive safety campaign was launched. Last year, Alabama had 22 fatalities, or one for every 436,364 tons. Several practices contributed to this improvement. Trip riders now wear gloves and rubber shoes. The use of goggles is obligatory in digging coal and when putting holes in the roof with picks. Most companies make physical

(Turn to page 233)

HOW TO CHARGE

+Mine Storage Batteries

By J. E. BORLAND

Mining Engineer
Westinghouse Electric & Mfg. Co.

BATTERIES for mining use generally consist of a group of cells of suitable size for the required ampere-hour capacity, with a sufficient number connected in series to give the desired voltage. Lead-acid and nickel-iron-alkaline cells are the two types commonly employed. The elements of a lead-acid cell, in the fully charged state, are a set of positive plates carrying lead peroxide meshed with a set of negative plates carrying sponge lead. Both sets are immersed in a dilute solution of sulphuric acid with a specific gravity of approximately 1.28 in an insulating jar.

While the cell is discharging, electrical energy is released by the electrochemical reaction of the sulphuric acid with the active materials of the positive and negative plates, forming lead sulphate on both sets of plates and gradually reducing the acid content of the solution. As the gradual accumulation of lead sulphate on the surface of the plates obstructs diffusion of the sulphuric acid to the active materials remaining, the discharge, in practice, should not be allowed to continue beyond the point where the cell voltage drops to 1.7 from an initial value of approximately 2. At this point, the specific gravity of the electrolyte is approximately 1.100 to 1.150.

In the nickel-iron-alkaline cell the active material of the positive plates is nickel hydrate and flake nickel arranged in alternate layers and the negative active material is iron oxide. The electrolyte is a dilute solution of potassium hydroxide. On discharge the electrolyte reacts on these materials, oxidizing the positive and reducing the negative. These reactions are reversed during charging, and the electrolyte remains practically unchanged in composition and specific gravity throughout the cycle of charge and discharge.

In recharging a lead-acid battery, direct current is supplied to it in an opposite direction, thus reversing the chemical reactions of discharge. Energy which must be returned to a battery to restore it to its original state of charge will exceed the energy discharged by the amount of the internal losses which take place on charge and discharge. With a discharge equal to rated capacity in ampere-hours this excess will be about 15 per cent.

The value of charging current which can be supplied safely to a lead-acid battery is dependent upon the state of discharge. In the discharged condition a high current can be used, as the energy supplied is used in the chemical reactions. As the process continues, with consequent reduction in the quantity of active material in discharged condition, and in the absence of a reduction in the charging current, the energy supplied will be in excess of that required in the further reaction of the active materials. This excess energy is consumed in decomposing the water of the electrolyte into hydrogen and oxygen, commonly known as "gassing." Excessive gassing is highly undesirable, as it tends to dislodge active material from the plates and overheat the battery, thereby shortening its life. Power also is wasted.

Of the several systems used to charge lead-acid batteries, the constant-current method depends on holding the charging current constant at a safe value by repeated adjustments of a rheostat in series with the battery or by gradually increasing the voltage of the charging bus to compensate for the rise in voltage of the battery. This current is continued until the gassing increases near the completion of charge, whereupon it is reduced to a lower "finishing rate."

The step method is a variation of the constant-current system in which charging is started at a higher current rate, which is maintained until the voltage per cell rises to 2.35, whereupon the current is stepped down to a lower value. Throughout the charging period the current is stepped down to a lower value each time the cell voltage reaches 2.35 until the finishing rate is reached. The current values for each step are determined by the number of ampere-hours discharged from the battery and by the time available for charging.

As compared to the constant-current system, the step method requires less time to complete the charge. Both methods, however, obviously require repeated changes in adjustment.

In the constant-potential system, the voltage applied to the battery is maintained at 2.3 per cell. This results in a high charging current at the start, tapering off gradually to a low value at the end of the charge, and at all times within a safe value for the state of charge. While this method offers a safe means of automatic charging, (1) the high currents at the start of the charge require corresponding capacity in the charging source, control devices and wiring, and (2) the low rates at the end prolong the time for completion.

The undesirable features of the constant-potential system are largely overcome by the modified constant-potential method, now generally favored. This system involves a charging source which will maintain practically constant voltage of 2.5 per cell or higher (for the lead-acid type) on the charging bus and a fixed resistor of predetermined value in series with each battery to be charged. For a given finishing current, the higher the bus voltage, the greater will be the ohmic value of the series resistor and the lower the starting current. With bus voltages of 3 per cell or higher, the constant-current system is approached.

A variation of the system based on the use of an individual generator for each battery to be charged is dependent on a generator design which gives a drooping volt-ampere characteristic equivalent to that produced at the battery terminals by the use of constant voltage at the charging bus and a fixed resistor in series with the battery.

Either arrangement results in a high charging current at the start, tapering off gradually to a low finishing current, as in the constant-potential system. In the modified constant-potential system, however, the finishing current is larger in comparison to the starting current than with constant-potential charging.

Fig. 1 shows a typical charge for a lead-acid storage battery and illustrates the principle of operation with the modified constant-potential system using a fixed resistor. As the charge pro-

gresses the battery voltage rises, and to maintain a corresponding increase in the voltage applied to the battery terminals the current automatically decreases, reducing the IR drop in the fixed resistor. When using an individual generator with a drooping volt-ampere characteristic, a similar change takes place, the current automatically decreasing to allow a corresponding increase in generator voltage as the battery voltage rises. Thus, by proper selection of the voltage of the charging source and the value of the fixed resistor, either one or both of the objectionable characteristics of the constant-potential system may be modified.

The desirable features of the modified constant-potential system are: (1) automatic charging, eliminating the human element and added expense; (2) completion of charge in a reasonable time; (3) charging currents automatically tapered off to a finishing rate of suitable value; (4) possibility of saving in size of charging equipment by the use of a moderately high starting rate; (5) efficient use of charging current, with consequent saving in power; and (7) simplicity of control apparatus.

While it has been the usual practice in the past to recommend constant-current charging for the nickel-iron-alkaline battery, any of the methods described for the lead-acid type may be adapted to this service. Equally good results are obtained with the modified constant-potential system, provided the average current on charge is equal to or greater than the normal charging rate recommended by the battery manufacturer. Because of the advantages of automatic operation, the modified constant-potential system, however, is generally recommended. Using this system, the voltage at the charging bus should be 1.84 per cell or higher; usually 1.84 to 2.1 volts per cell. At higher voltages the charge approaches that of the constant-current system. A typical charge with a bus voltage of 1.84 per cell and fixed resistor is shown in Fig. 2. Where an individual generator is used with each battery to be charged, it is possible to design the generator with a drooping volt-ampere characteristic, making the series resistor unnecessary.

The fixed resistor used with the modified constant-potential system should be of suitable ohmic value to reduce the voltage at the battery terminals to the proper values at any state of battery charge. The resistance of all leads and connections from the constant potential bus to the battery terminals should be considered a part of the fixed resistor. With the lead-acid battery, a voltage of 2.45 per cell at the battery terminals at the end of the charge will result in a finishing current that will be useful for charging and will not cause excessive gassing or high temperatures. Using this value, the number of ohms in the fixed resistor for each cell connected in series on charge is

$$R = \frac{E - 2.45}{I_f}$$

Where E = bus volts per cell
I_f = desirable finishing current.

In charging the nickel-iron-alkaline battery the finishing rate should be not less than 65 per cent of the normal 5-hour discharge rate. The voltage impressed on the battery terminals at the finishing rate should be approximately 1.74 per cell. Using these values, the number of ohms in the fixed resistor per cell of battery connected in series on charge is

$$R = \frac{E - 1.74}{0.65\, I_n}$$

Where E = bus volts per cell
I_n = normal charging rate in amperes by constant current method = 5-hour discharge rate of battery.

Based on the above principles, Tables I and II show approximate ohms required in the fixed resistor for each cell of battery connected in series on charge, as well as starting and finishing currents. The values to be used will vary slightly from those shown by these tables, depending upon the construction and make of battery, age, temperature and time of standing after discharge. To allow for such variations it is advisable to use an excess of approximately 10 per cent in ohmic value of fixed resistor above that indicated by the tables and to provide the resistor with several end taps so that adjustment can readily be made, if required. The continuous current capacity of the charging resistor should be practically equal to maximum starting current.

The power required of the charging source at any time during charge is

$$KW = \frac{I \times E_b}{1{,}000}$$

Where I = charging current.
E_b = voltage at charging bus.

The charging machine should have

Fig. 1—Typical Charge for a Lead-Acid Battery Using the Modified Constant-Potential Method

Fig. 2—Typical Charge, Nickel-Iron-Alkaline Battery, Modified Constant-Potential Method

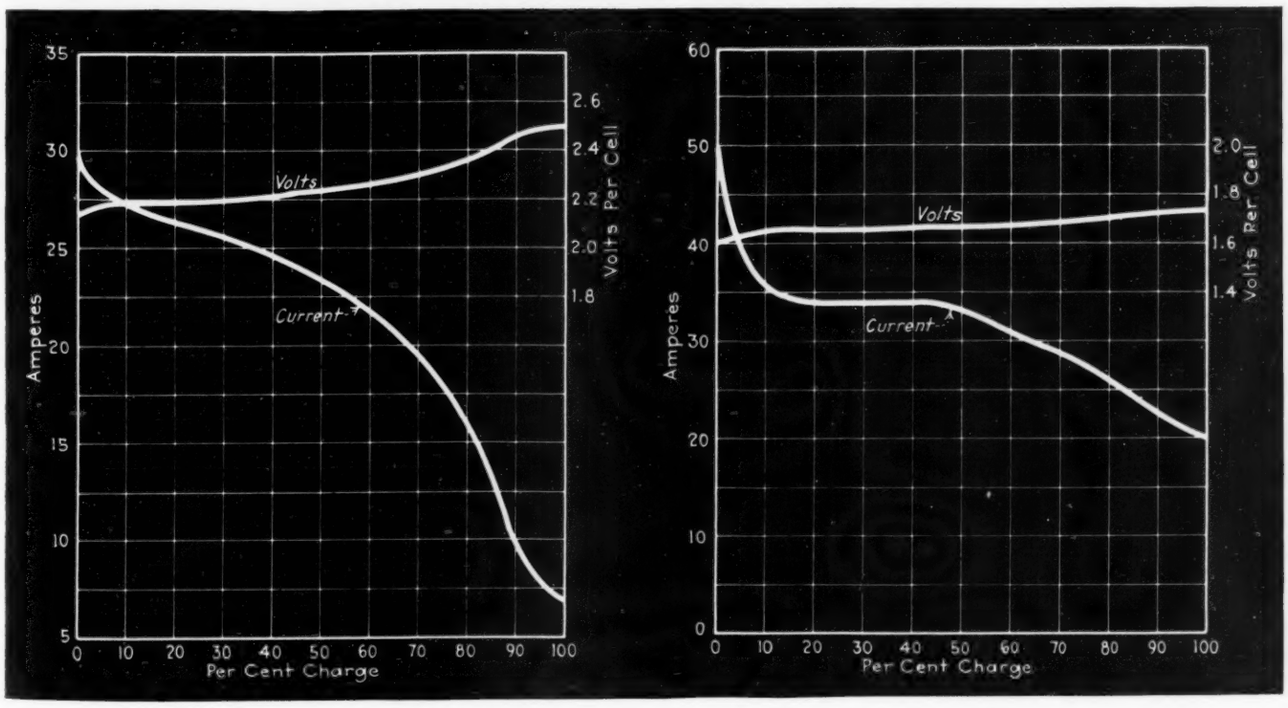


Table I—Lead-Acid Type Batteries—Modified Constant Voltage Charging

Capacity of Battery at 6-Hr. Rate of Discharge Ampere-Hours	Charge in 6-Hr. 2.5 V. per cell at bus		Charge in 7½ Hr. 2.6 V. per cell at bus		Charge in 10 Hr. 2.7 V. per cell at bus		Charge in 11 Hr. 2.8 V. per cell at bus		Charge in 12 Hr. 2.9 V. per cell at bus		Approx. Current at Finish of Charge, Amperes	*48-Cell Battery With Max. Bus Volts 125 or 2.6 V. per Cell Fixed Resistor Ohms
	Fixed Resistor Ohms per Cell	Current at Start of Charge, Amperes	Fixed Resistor Ohms per Cell	Current at Start of Charge, Amperes	Fixed Resistor Ohms per Cell	Current at Start of Charge, Amperes	Fixed Resistor Ohms per Cell	Current at Start of Charge, Amperes	Fixed Resistor Ohms per Cell	Current at Start of Charge, Amperes		
100	.007	39	.0175	24	.035	15.5	.049	11	.063	7.5	7	.84
150	.00467	58.5	.01167	36	.02333	22.3	.03267	16.5	.042	11.3	10.5	.56
200	.0035	78	.00875	48	.0175	31	.0245	22	.0315	15	14	.42
250	.0028	97.5	.007	60	.014	38.8	.0196	27.5	.0252	18.8	17	.336
300	.00233	117	.00583	72	.01167	46.5	.01633	33	.021	22.5	20	.28
350	.002	136.5	.005	84	.010	54.3	.014	38.5	.018	26.3	23.5	.24
400	.00175	156	.00438	96	.00875	62	.01225	44	.01575	30	27	.21
450	.00156	175.5	.0039	108	.00778	69.8	.01089	49.5	.014	33.8	30.5	.1867
500	.0014	195	.0035	120	.007	77.5	.0098	55	.0125	37.5	34	.168
550	.00127	214.5	.00318	132	.00636	85.3	.00891	60.5	.01145	41.3	37.5	.1527
600	.00117	234	.00291	144	.00583	93	.00817	66	.0105	45	41	.14
650	.00108	253.5	.00269	156	.00533	100.8	.00754	71.5	.00965	48.8	44.5	.1293
700	.001	273	.0025	168	.005	108.5	.007	77	.009	52.5	47	.12
750	.00093	292.5	.00233	180	.00467	116.3	.00653	82.5	.0084	56.3	50.5	.113
800	.00088	312	.00219	192	.00438	124	.00613	88	.00775	60	54	.105
850	.00083	331.5	.00206	204	.00413	131.8	.00576	93.5	.00741	63.8	57.5	.0988
900	.00078	351	.00195	216	.00389	139.5	.00545	99	.007	67.5	61	.0933
950	.00076	170.5	.00184	228	.00368	146.3	.00516	104.5	.00663	71.3	64	.0884
1,000	.0007	390	.00175	240	.0035	155	.0049	110	.0063	75	67.5	.084

*Charge in 7½ hours with current at start of charge as indicated in Column 5.

an overload capacity equivalent to the maximum starting current. With a low voltage per cell, approaching constant current charging, the continuous capacity should be at least 80 per cent of this. Slightly lower continuous ratings are possible with higher voltages per cell, as the charging current decreases at a more rapid rate from the starting value.

A lead-acid storage battery in daily use should receive an overcharge once a week by continuing the normal charge at the finishing, or lower, rate until specific gravity readings, taken on several pilot cells at half-hour intervals, remain constant for several hours. In case the ampere-hour capacity of a battery is insufficient to carry it through the shift, booster charging at a high rate, depending upon the state of discharge, may be resorted to during idle periods.

Any steady, reliable source of d.c. power with suitable voltage characteristics may be used for battery charging. If the voltage available is too high it may be reduced to suitable values through the use of a motor-generator set or balancer sets. Where a.c. is available, it generally is more satisfactory to use this for battery charging through the medium of conversion apparatus, as the d.c. source may thus be made independent of other load. While it is possible to use a rotary converter or one of several forms of rectifiers, a motor-generator set is preferable because its d.c. voltage is practically independent of a.c. voltage variations.

To indicate the state of the battery charge it is general practice to mount an ampere-hour meter on the locomotive. An alternative is the installation of ampere-hour meters on the charging panels. In automatic charging it is particularly advantageous to disconnect the battery by opening a circuit breaker when the required number of ampere-hours have been delivered. The meter may be arranged to run efficiently slower in the reverse direction to allow for battery losses before operating its contact.

The charging panel for each battery circuit should include: overcurrent protection; reverse-current protection; provision for reading charging current; provision for reading the battery voltage; a two-pole, single-throw switch; a fixed resistor; and a shunt-trip circuit breaker, or equivalent. In addition, starting and protective equipment for the a.c. side of any conversion equipment used is necessary.

The battery charging station should be located in a clean, dry, moderately warm place provided with ample ventilation to prevent possible accumulation of explosive mixtures of gases.

In servicing lead-acid batteries the following rules should be observed:

1. Avoid excessive gassing.
2. Keep cell temperatures within 115 deg. F.
3. Maintain electrolyte level above tops of separators by adding distilled water as required.
4. Avoid addition of acid under normal conditions. In case of loss from any cause it should be made up as instructed by the battery manufacturer.
5. Keep battery top clean by use of a wet cloth.
6. Neutralize spilled acid with ammonia or washing soda.
7. Keep battery terminals covered with vaseline.
8. Keep open flames away from the battery at all times.
9. Avoid exposure to low temperature in the discharged state.
10. Take voltage readings while the battery is charging or discharging.
11. Take specific-gravity readings only after sufficient time to allow uniform distribution of acid in the electrolyte. It should be noted that specific-gravity readings will vary considerably with the temperature.
12. Read and keep a record of the specific gravity and voltage of each cell of batteries in regular use several times a year.
13. Inspect frequently for possible damage or defects in jars, terminals or connections.
14. Charge battery before allowing it to stand idle.
15. Give each battery in daily service an equalizing charge once a week.

Table II—Nickel-Iron-Alkaline Type Batteries—Modified Constant Voltage Charging—Charge in 7 Hours

Capacity of Battery at 5-Hour Rate of Discharge Ampere-Hours	2.1 Volts per Cell at Bus			2.0 Volts per Cell at Bus			1.9 Volts per Cell at Bus			1.84 Volts per Cell at Bus			80-Cell Battery Max. Bus Volts 160 or 2 V. per Cell Fixed Resistor Ohms Total	Normal Charging Current 7-Hour Rate, or 5-Hour Discharge Rate Amperes
	Fixed Resistor Ohms per Cell	Current At Start of Charge Amps.	Current At Finish of Charge Amps.	Fixed Resistor Ohms per Cell	Current At Start of Charge Amps.	Current At Finish of Charge Amps.	Fixed Resistor Ohms per Cell	Current At Start of Charge Amps.	Current At Finish of Charge Amps.	Fixed Resistor Ohms per Cell	Current At Start of Charge Amps.	Current At Finish of Charge Amps.		
150	.0143	35	27	.0110	41	25	.0077	47	23	.0050	50	20	.088	30
187.5	.0114	44	34	.0088	51	31	.0062	59	28	.0040	63	25	.071	37.5
225	.0095	53	41	.0073	62	38	.0051	70	34	.0033	75	30	.059	45
262.5	.0082	61	47	.0063	72	44	.0044	81	39	.0029	88	35	.051	52.5
300	.0072	70	54	.0055	82	50	.0039	94	45	.0025	100	40	.044	60
337.5	.0063	79	61	.0049	92	56	.0034	104	51	.0022	113	45	.039	67.5
375	.0057	88	68	.0044	103	63	.0031	116	56	.0020	125	50	.035	75
393.75	.0054	92	71	.0042	108	66	.0030	121	59	.0019	129	53	.034	78.75
450	.0048	105	81	.0037	123	75	.0026	138	68	.0017	150	60	.030	90
562.5	.0038	132	101	.0029	154	94	.0020	172	84	.0013	188	75	.023	112.5
675	.0032	158	122	.0024	185	110	.0016	212	101	.0011	225	90	.019	135

SAFETY AT ANY COST

+ Theme of Inspectors' Meeting

DANGERS assuming increased importance in American mining—to wit, bumps and explosions of hydrogen—were discussed at the 25th annual convention of the Mine Inspectors' Institute of America, meeting at Louisville, Ky., May 7-8. Inventory was taken of safety accomplishments to date; means for putting accident-prevention cost and accident cost in more tangible form also were discussed; the NRA and its effect on safety had its inning; and the old yet ever new problem of whether mine officials should be allowed to wear electric cap lamps when carrying flame safety lamps was explored in every direction. Attendance numbered 53, and new members 22. Next year's meeting is scheduled for Beckley, W. Va.

Three charter members, each a veteran of 50 years in mining—Edward Flynn, chief inspector, Tennessee Coal, Iron & R.R. Co.; J. J. Rutledge, chief, Maryland Department of Mines; and John Dunlop, manager, Bituminous Casualty Corporation—participated in a program setting forth the history and achievements of the institute from earliest days, to which response was made by P. J. Friel, president. Cost of accidents, declared Mr. Flynn, should not be discussed in these meetings; the institute's job is to concentrate on accident prevention, disregarding cost.

Coal bumps in eastern Kentucky and southwestern Virginia mines have occasioned much trouble, said J. F. Bryson, safety director, Harlan County Coal Operators' Association. Several mines in this mountainous region, after fifteen to eighteen years of operation, have experienced outbursts, said Chairman John F. Daniel, Kentucky's chief inspector. Mitigation of the consequences—by changes of mining methods, if need be—and advance indications that will enable timely withdrawal of workers are being sought. In the present year bumps have caused three fatalities in Kentucky and as many more in Virginia, added J. F. Davies, U. S. Bureau of Mines.

Outbursts have occurred in the Harlan, Darby and "C" seams, which are 42 to 48 in. thick, of medium hardness and well-defined cleavage. These measures lie flat and well above sea level, with 600 to 2,300 ft. of cover. In each instance, the immediate roof is a strong sandstone stratum with other sandstones above it, 15 to 90 ft. thick. In fact, the roof is predominantly sandy. Floor consists of 3 to 5 ft. of strong, dark shale underlaid by sandstone.

As much as 500 tons of coal may be thrown out by the bumps. In some instances, bumps have disturbed buildings miles away. They give no warning except that the working area becomes quiet before they occur. Coal, which prior to a bump works freely, becomes thereafter hard and dense.

Officers, Mine Inspectors' Institute of America, appointed for ensuing year:

President, John G. Millhouse, Illinois; first vice-president, Thomas Stockdale, West Virginia; second vice-president, James Berry, Ohio; third vice-president, Richard Maize, Pennsylvania; secretary, C. A. McDowell, Pennsylvania; assistant secretary, J. J. Forbes, Pennsylvania; treasurer, J. J. Rutledge, Maryland; editor in chief, James T. Beard, Connecticut; publicity editor, R. Dawson Hall, New York.

After a bump rarely are timbers found broken; excessive loading is seldom indicated and cracks in roof and heaving of floor are unusual. In the bump area no subsidence is in evidence, but several hundred feet inby, the roof has been known to subside as much as 4 in. Though the roof may lower only a fraction of an inch, the impact suffices to split the pillar and thrust coal into the roadway.

Mr. Bryson advocated longwall with packwalls, either on retreat or advance, as this would allow the massive roof strata to bend gradually. Hitherto, rooms generally have been driven advancing, taking about 65 per cent of the seam. Mr. Bryson would limit first take to 30 per cent and drive rooms retreating, thus salvaging existing development. Longwall increases cost, but with compensating increase in lump yield, said C. A. Herbert, U. S. Bureau of Mines. To try to hold the roof with posts and jacks alone does not keep in mind the main objective in longwall mining; for best results, packwalls must be used.

Mr. Bryson intimated that operators are reluctant to introduce longwall. Because of the strength of the sandstone, which breaks jacks and makes roof uncontrollable, long faces at one mine have failed to solve the problem. Bumps have reversed air currents some 3,600 ft. from the focus of disturbance, and a similar result has been noted also in adjacent mines. Companies scout the idea that when bumps occur, methane is evolved in non-gassy mines, but in one such mine a flame safety lamp detected methane after a bump. This, with coal-dust clouds and open lights, leads him to predict that an explosion will inevitably follow some of these bumps unless precautions be taken. Closed lights obviously are needed.

Coal left in removing pillars accentuates the trouble, remarked Mr. Daniel. Some pillars are merely slabbed and abandoned, and in some cases walls of gob rock are built along room ribs. Heavy timbering and timbers left on retreat add to the difficulty.

A comparison of accident-prevention cost with cost of accidents was made by William Roy, safety director, Hanna Coal Co., Ohio. Operators who will do nothing to prevent accidents face such penalties above the basic rate—in Ohio, $9.50 per $100 of payroll—as will drive them out of business. The highest rate paid in the State is over $18, a penalty of about 90 per cent, and the lowest is $4.75, which is a merit rating of 50 per cent.

Speaking nationally, 77.7 non-fatal accidents occurred for every fatality—an average of 170,307 annually during 1922-32. Records show an average compensation cost of $168 for each, or an annual cost of $32,188,000, which amounts to 5½c. per ton.

The accompanying table shows the cost of experience of the Hanna Coal Co. Administration activity covers all expenses of safety department, includ-

ing attendance at compensation and court hearings. A table showing cost of supervision, administration and medical attention in accident prevention demonstrated that this cost is small, totaling 35c. per $100 of payroll, or 0.29c. per ton.

A letter of inquiry directed to coal companies, declared J. J. Forbes, U. S. Bureau of Mines, revealed that none of them kept a close record of accident cost. Reported cost of accident prevention was from 0.3c. to 3c. per ton. J. B. Allen, safety engineer, Hazard Coal Operators' Exchange, outlined safety progress in the Hazard field. From 1930 to 1933 tons mined per injury increased gradually, and time lost per injury materially lowered. During this period, a group of 25 mines producing 13,000,000 tons reduced compensation cost 1.5c. per ton.

In Pennsylvania those who spend most for accident prevention have the lowest accident cost, declared Richard Maize, acting bituminous deputy secretary of that State. Mr. Forbes said these items everywhere bear comparable relation. In 1933, seven inspection districts, Mr. Maize asserted, produced over a million tons per fatal accident; one produced 2,900,000 and another 3,000,000. Still another district, having 90 small operations, went through the year without a fatal accident.

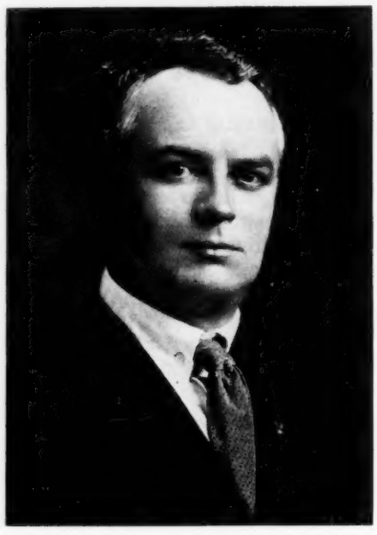
William Glennon, chief inspector, Kansas, declared that safety has so retrograded in his State that no agency will write coal-mine compensation policies. First-aid training also is now unknown. The metal-mining industry of his State, however, is extremely active, and of 6,000 men employed, only one was killed last year.

When a speaker suggested that firebossing and timbering are logically accident-prevention costs, Mr. Bryson recommended that the institute decide what items be charged to accident prevention, and Mr. Maize advocated that only those provisions not required by law be so charged.

Gas from a hollow air-pump piston caused an explosion at a mining plant when the parts were being salvaged, declared Mr. Davies. This accident was ascribed to the presence of long standing water in the piston and the consequent liberation of hydrogen. Several similar accidents had occurred in Norfolk & Western R.R. shops. These led to promulgation of a rule that no light be inserted in a closed container or heat applied thereto until after it has been properly vented.

Whether a mine official should be permitted to wear an electric cap lamp when making an examination requiring use of a flame safety lamp was discussed by Mr. Maize. Four main factors are involved in the controversy: (1) An examining official wearing an electric cap lamp is likely to neglect his flame safety lamp. (2) Some contend that when he wears a cap lamp his ability to detect methane, particularly in lean mixtures, is impaired. (3) An electric cap lamp greatly aids an examiner to detect bad roof. (4) If an official errs in examination of roof, the resulting accident usually involves only one person, but should he err in examination for methane, several hundred lives may be jeopardized.

The Pennsylvania bituminous mining law states that "in making the examination he shall use no light other than that inclosed in an approved safety lamp." An order issued by Walter H. Glasgow, Secretary of Mines, of Pennsylvania, forbids firebosses carrying an electric cap lamp on their first round. As many lives have been lost in recent years through improper use of flame safety lamps, he exhorts inspectors in that order to use only an approved flashlight when the light from the flame safety lamp is insufficient.



John G. Millhouse
President-Elect, Mine Inspectors' Institute

Issuance of this order was influenced by findings in the only major disaster in the country for 1933. On the day of the explosion the fireboss blamed wore an electric cap lamp on his first round. He admitted he did not extinguish this lamp when examining for gas. For this reason it was doubted whether he had made a proper examination. Cap-lamp manufacturers have been asked to develop, for use by examiners, a special cap lamp with a release switch which will open unless held closed by hand. One such lamp is under examination for government approval.

Pennsylvania State inspectors differ on this matter. Advantages of the electric cap lamp are: It furnishes better illumination. The official is not blinded at the working face by the workers' lamps when he himself wears a cap lamp. Better examinations of working places, roof and posting can be made. The cap lamp allows the official to retreat to safety should his flame safety lamp go out. Greater traveling speed can be made between places, and he can keep better notes of mining conditions.

Disadvantages are the possibility that an official, by failing to note that his flame safety lamp is no longer burning, may travel in places with a low-oxygen content without becoming cognizant of that fact, and that he may fail to turn off his electric lamp when examining for gas. Having a cap lamp, an examiner, no longer compelled to use his flame safety lamp, is likely to overlook its methane indications.

Some contend eyes subjected to the bright light of an electric lamp too slowly adjust themselves to the dim light of the flame safety lamp to be immediately available for examination of gas. Preliminary tests made by the U. S. Bureau of Mines tend to prove that little delay is needed for this adjustment.

Pillar lines cannot be properly examined without an electric lamp, declared Charles P. Sutherland, safety director, Inland Steel Co. mine, Kentucky. Mr. Forbes announced that as the result of the tests to which Mr. Maize made reference, the U. S. Bureau of Mines is conducting further tests on flame safety lamps and obtaining facts which should have been available 50 years ago. One is that a temperature constant is reached inside the gauze of the lamp for each increment of methane percentage.

Two papers were presented on the need of bringing all coal mines under the jurisdiction of State mining departments, one by Dr. Rutledge and the other by James Dalrymple, chief mine inspector of Colorado. A 20-year average for Colorado shows that 5.25 men were killed per thousand employed, and 151,112 tons produced for each life lost. Mines employing ten men or less during this period killed 6.37 per thousand employed and produced only 72,010 tons per fatality. Mines employing five men or less killed 7.56 per thousand employed and produced only 56,237 tons per life lost.

State mining departments, said Dr. Rutledge, should not be charged with responsibility for accidents in mines over which they have no jurisdiction. Mines small at the start frequently develop into larger producers and are not properly projected, particularly with respect to number of openings and ventilation. Before a new mine is opened, plans for the layout should be subject to State approval, much as construction is controlled by building codes.

Kentucky has about 1,100 such small mines, said Mr. Daniel. The new State law puts all mines that sell or exchange under the direction of the department and provides additional inspectors to enforce the law. After July 1 no mine—

Accident and Prevention Cost Sheet of M. A. Hanna Coal Co.

	1928	1929	1930	1931	1932	1933
Tons Mined	540,831	1,716,542	2,138,059	2,137,079	1,233,733	2,019,475
No. of compensable accidents	89	231	240	100	71	96
No. of medical cases only	148	320	190	95	64	44
No. of fatalities	5	3	6	3	2	3
Total accidents	242	554	436	198	137	143
Cost of total accidents	$86,746.38	$85,829.82	$106,725.04	$93,984.71	$46,250.43	$39,068.91
Cost per ton	0.160*	0.050	0.049	0.044	0.035	0.019
Cost per $100 payroll	13.11	5.40	5.13	4.96	5.36	2.95
No. of man-days (8 hr. per day)	.....	321,005	395,739	371,888	211,663	356,364
Comp. accidents per 1,000 man-days	.....	0.719	0.606	0.269	0.335	0.269
Medical cases per 1,000 man-days	.....	0.997	0.480	0.255	0.302	0.123
Total accidents per 1,000 man-days	.....	1.726	1.102	0.532	0.647	0.401
Tons produced per accident	2,235	3,098	4,904	10,793	9,005	14,122
Tons produced per fatality	108,166	572,181	356,343	712,360	616,866	673,158
Cost of administration of safety dept.	$4,160.00	$4,200.00	$4,127.15	$9,339.98†	$4,834.13	$5,390.35
Cost per ton	0.0076	0.0024	0.0019	0.0043	0.0039	0.0027
Cost per $100 payroll	0.63	0.26	0.19	0.49	0.56	0.41

*High cost result of labor trouble. †Picnic of all employees and their families charged to safety department.

large or small—can be opened until its plan has been approved by the department. All employees must be trained in first aid, and any mine employing six or more men must be supervised by a certified foreman. Mr. Maize said that, effective July 1, all mines in Pennsylvania employing five or more men come under the provisions of the mine law.

The economic effect of the coal code on mines of western Kentucky was discussed by Mr. Daniel, and its effect on discipline and safety by N. P. Rhinehart, chief, West Virginia Department of Mines. In the early days of code operation foremen hesitated to enforce discipline for fear of the men. Operators were too busy in code affairs to correct the situation. Workers, also, were more interested in earnings than in personal safety. But with increased earnings, the workers gained confidence and decided they had something to live for. From then on they cooperated with the owner in furthering safety, even suggesting more practicable company rules. With this reversal of interest a decided improvement was made. Healthier working conditions were established; the miners insisted that mining laws be obeyed and discipline recognized as part of their contract. The "New Deal" has reduced labor turnover, and thus increased safety.

Accident records in West Virginia revealed that 30 per cent of all fatal accidents happen to men who have worked for their last employer less than six months. Mr. Rhinehart added that of the non-fatal accidents occurring in his State last year, 1 per cent could have been avoided by use of protective hats, 4 per cent by goggles, and 5 per cent by safety shoes.

In a paper on the importance of relating accidents to classes of employees, C. A. Herbert, U. S. Bureau of Mines, stated that information for such study was lacking in Mid-Western fields, and presumably in others. But he did find a record of 1,227 fatalities occurring in Illinois during 1923-1932, from which he made a partial analysis. His paper was accompanied by a number of tables which are summarized in part herewith.

Taking into consideration number employed, or hours of exposure, mine bosses head the list, with approximately three times as large a proportional fatality loss as miners. In a similar study made in Indiana essentially the same relation was found, indicating that bosses are not safety-conscious and set workers a poor example. Under falls of roof, relative fatality rating for miners is 35; for machine men, 40; laborers, 50; timbermen, 63; and bosses, 100. Under falls of coal, miners rated 41, with machine men 100. Under mine cars, with tripriders as 100, drivers rated 81. Fatalities caused by electricity, with a rating of 100 for machine men, gave 71 for bosses. Explosions and ignitions caused a rating of 100 for shotfirers and 69 for bosses. Under suffocation, other than from explosions, the bosses had the highest and worst rating.

Mine operators and employees must do more than merely live up to the law, as it probably is true that few accidents are the result of direct statutory violations. Such supposedly time-saving practices as coupling cars on the fly, jumping on and off moving trips and running ahead to open a door or throw a switch do not add a single ton to the production a haulage crew can handle. A. F. Brosky, consulting editor, *Coal Age,* remarked that general studies of this sort were valuable in showing trends for a region and in educational work, but they are of no real value to the individual company. Individual companies should be urged to keep their own accident records on a job basis. This is the next big step toward accident elimination and greater operating efficiency.

Is Safety Imperiled by New Deal?

(Concluded from page 227)

examinations of their employees. Men are disciplined for their first offense against safety regulations by receiving a ticket; for the second, by a suspension varying with the gravity of the violation; discharge is the penalty for a third offense. Some mines give bonuses to foremen for operating a specified time without a lost-time accident.

The New River Coal Oerators' Association, explained Charles E. Vawter, assistant engineer, Gauley Mountain Coal Co., organized a safety committee representing all companies in the district in 1926. This committee studies all accidents and reports its conclusions and recommendations back to the operators. No man is allowed to ride on the trolley-wire side of a mine car or in the first car behind a locomotive. This rule was promulgated after a trolley pole had pulled down rock on the men in the front car with disastrous results. Brakemen are required to use police whistles. Hanging curtains are discouraged and canvas doors are recommended. The committee is now considering a demand that all new locomotives be equipped with a seat for the brakeman. Men are disciplined for the first offense against safety regulations by making them report to the foreman; a second offense means a session with the superintendent, and the third infraction results in discharge.

The Princeton (Ind.) Mining Co., declared R. J. Smith, president, believes it undesirable to make a lot of rules. A safety man is employed to go round the mines to make specific suggestions for the promotion of safety.

In presenting a Holmes Association certificate of merit to the Pine Hill Coal Co., Minersville, Pa., Scott Turner, director, U. S. Bureau of Mines, stated that the company had operated from Jan. 12, 1932, to Feb. 28, 1934, without a fatal accident and under natural conditions commonly considered hazardous. Production during that period was 1,147,000 tons and 750 employees worked a total of 3,485,000 man-hours. Accepting the award on behalf of the company, T. M. Dodson, president, gave credit for the achievement to the mine officials and workmen.

MEETING NEW-DEAL PROBLEMS

+ Through Mechanization of Mining

Dominant Theme of Cincinnati Exposition

CONCRETE evidence of the manufacturers' contribution to the coal industry's drive for lower costs and a higher-quality product was afforded in the exhibits offered by 93 builders and distributors of mining equipment and supplies at the Eleventh Annual Convention of Practical Coal-Operating Men and National Exposition of Coal Mining Equipment, held at Cincinnati, Ohio, May 7-11, under the auspices of the Manufacturers' Section, Coal Division, American Mining Congress. Higher capacity, greater efficiency, longer life and safer operation were the principal points stressed in the various displays of equipment for all phases of mining, preparation and safety.

LOADING equipment of all types, cutting machines and drilling equipment were major attractions at the Cincinnati exposition. Joy Mfg. Co., Franklin, Pa., exhibited the new Joy 10BU and 8BU loaders, bringing its list of types up to four, including the 7BU and 5BU machines. Rated capacity of the 10BU loader is given as 4 tons per minute, against 1½ tons for the 8BU and 2 tons for the 7BU and 5BU loaders; maximum capacities are: 10BU, 6½ tons per minute; 8BU, 2½ tons; 7BU and 5BU, 3½ tons. Weight of the 10BU type is 18,000 lb.; 8BU, 9,500 lb.; 7BU, 14,500 lb.; 5BU, 15,600 lb. Dimensions are: height—10BU, 54 in.; 8BU, 35 in.; 7BU, 40 in.; 5BU, 53 in.; width—10BU, 7 ft.; 8BU, 4½ ft.; 7BU and 5BU, 6 ft.; length—10BU, 25 ft.; 8BU, 20 ft. 5 in.; 7BU, 23 ft. 9 in.; 5BU, 24 ft. 6 in.

Caterpillar speed varies from a low of 36 ft. to a high of 178 ft. per minute for the 10BU type, against 55 and 170 ft. per minute for the 8BU, and 37 and 114 ft. per minute for the 7BU and 5BU loaders. Maximum reach of the gathering arms is: 10BU, 7 ft. 4 in.; 8BU, 5 ft. 4 in.; 7BU and 5BU, 6 ft. 8 in. One-man control, in addition to other features, is cited by the company as a major advantage from the standpoint of operating flexibility.

Myers-Whaley Co., Knoxville, Tenn., demonstrated the Whaley "Automat" loader, No. 3 size. Lorain Steel Co., Johnstown, Pa., displayed the Lorain room conveyor and discharge elevator. Robins Conveying Belt Co., New York, exhibited sections of its underground belt conveying equipment for mines *(Coal Age*, December, 1933, p. 434).

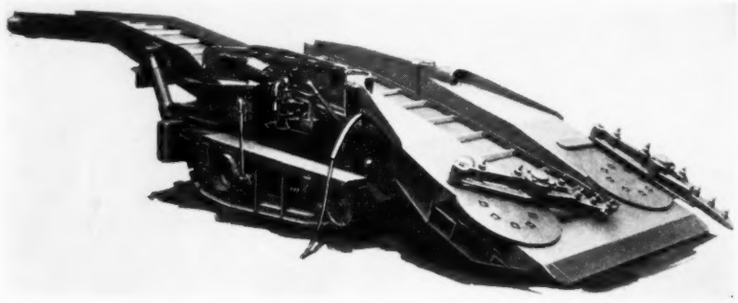
Jeffrey Mfg. Co., Columbus, Ohio, had on display an a.c. Type 44-D loader, Type 61-AM room conveyor, Type 61-HG face conveyor, Type A-6, permissible post-mounted drill, Type A-7 portable electric drill *(Coal Age*, March, 1934, p. 117), a 29-LE "Arcshear" cutter equipped with a new spooling device for the cable reel, a Type A-6 permissible drill, and a Type 35-L shortwall cutter.

Goodman Mfg. Co., Chicago, demonstrated a Type 624CJ combination slabbing and shearing machine, consisting of a Type 624 combination machine modified to include a shearing element. The latter is supported from beneath by a slide rail, with a guide bar at the top, and is driven backward and forward by a rack and pinion. The cutting motor drive is used for both slabbing and shearing cuts and is interlocked so that the machine may be operated either way at will, but so that both units cannot be operated at the same time. Both permissible and open-type models are available for 250 or 500 volts in gages from 36 to 48 in. Principal dimensions are: over-all height, 4 ft.; width, 5 ft. 11 in.; length, 28 ft. 1¼ in.; wheelbase, 42 in.; wheel diameter, 11½ in. Cutting limits, according to the company, are: bottom cutting, 6½ in. below to 9 in. above top of rail; shearing, 6½ in. below to 8½ ft. above rail top. With cutter bar for 9-ft. undercut, room widths, with track in center of room, vary from a minimum of 14 ft. to a maximum of 32 ft. Maximum distance from the end of the track to the face is 4¾ ft.

The Goodman company also displayed Types G-15, G-20 and E-10 shaker conveyor drives; the Type LOA duckbill and feeder head for shaker conveyors; swivel troughs; trough supports; the "Cosco" speed-link and MacHatson trough fastenings; pony trucks for carrying material along shaker lines; shaker-conveyor guide frames; ball-bearing anchor jacks; and other shaker-conveyor parts, as well as the sawbill loading head *(Coal Age*, February, 1934, p. 44).

Cutting machines and coal saws were among the features of the exhibit of the Sullivan Machinery Co., Chicago, in addition to the new "pulsing-power" feed developed by the company for its longwall and shortwall cutters to eliminate the tendency of the cutter chain to bind and clog with the present high rates of feed, and thus enable the

Joy 10BU Loader



bits to clear themselves of the cuttings at maximum feeding speeds. The pulsing power feed, according to the company, consists of a cam mechanism and two friction clutches—one for fast feed for moving the machine and the other for slow, or cutting, feed. Both clutches are controlled by one handwheel and cannot be used simultaneously, as there is a neutral point between them. Through a yoke mechanism, the slow-speed, or cutting, friction is engaged and disengaged alternately, as compared with the ratchet drive, thus causing the feed to slow down and speed up to normal without jerk and allowing the bits to clear the cut before each advance. The pulsation, it is said, is so rapid as to result in no apparent strain on the feed rope. Rate of feed, according to the company, can be varied at will by turning the feed-control handwheel, which controls the duration of advances and pauses (long advances with short pauses or vice versa) as required by cutting conditions.

Sullivan also demonstrated the Joy-designed 6-A track-type coal saw, featured by the use of hydraulic power

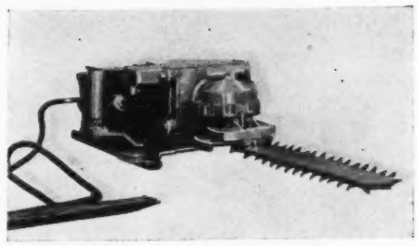
Sullivan 6-A Track-Type Coal Saw

for operating vertical and horizontal feeds, rotating the saw head, tilting the saw blade, setting roof jack and operating breaker pad for breaking down the face after the coal is sawed into blocks. Length with blade in cutting position is 24 ft.; with blade folded back for tramming, 18 ft. Over-all height is 29 in. Performance possibilities with a 6-ft. saw blade, as outlined by the company, are: cutting radius, 18 ft.; maximum width of shear cut parallel to track, 24 ft.; cutting range, 12 in. below track to 5 ft. above—modified type, 8 ft. above; shearing radius at right angles to the track, 18 ft.; parallel shear cuts from center of track, 12 ft.

The 52-B floor-type coal saw also was displayed by the company, which pointed out that this machine is similar to the 51-B type, with the exception that the control is carried by the tramming truck, also on display. This machine, according to the company, can saw or shear at any height from zero to 56 in. Depth of saw slot is 6 ft., and principal dimensions are: over-all height on floor, 26⅝ in.; on truck, 29⅝ in.; width, 49 in.; length, without blade, 8½ ft. Hydraulically operated walking cylinders are provided for moving the saw on the bottom.

Another new Sullivan product was the CA-14 track-mounted self-propelled coal cutter with a power-swing adjustable-height cutter bar for making arcuate or slabbing cuts up to a maximum width of 32 ft. The machine may be furnished as either an undercutter or overcutter and also, it is said, can be changed easily from one to the other in the field. Kerfs 4 in. thick to an effective depth of 9 ft. are possible, and the frame is suspended at three points—rear axle gear box, to allow tilting around the longitudinal axis of the machine, and at each front wheel mounting. This type of suspension allows the frame to be tilted both transversely and longitudinally through the use of a hydraulic ram assembly on each front wheel. Additional combination hydraulic ram and link assemblies operate on the cutter-bar frame and the extension feed frame to swing the cutter bar through a total angle to 90 deg., measured from the long axis of the machine. Separately, each assembly gives a total swing of 45 deg. As the two motions are independent, it is possible, according to the company, to make either arcuate or substantially straight cuts across the face. Height adjustment also is accomplished by a hydraulic ram, and another ram is used to tie the main frame to the rear truck carriage, aiding the front-wheel hangers in tilting the frame and acting as an anchor to maintain whatever tilt is desired.

The CA-14 machine is available with either a.c. or d.c. equipment of the open or government-approved type. Over-all traveling height is 31 in. with the undercutter and 41 in. with the overcutter with 16-in. wheels. Width is 62 in. and length, without cutter bar, is 18 ft. 5¼ in. Cutting range with the undercutter



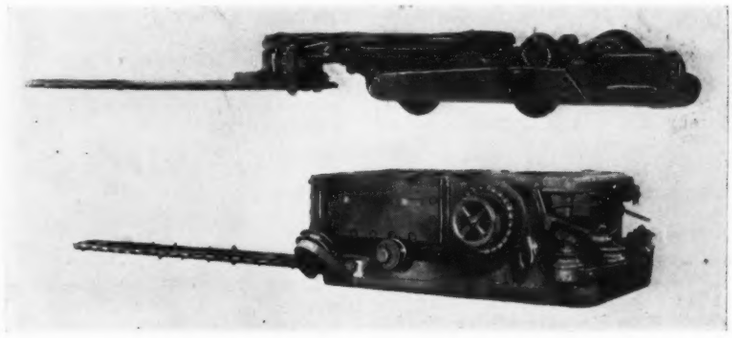
Sullivan Floor-Type 52-B Coal Saw and Breaker Pad

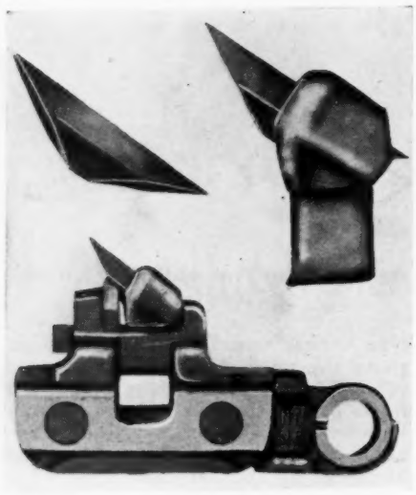
type varies from 7 in. below to 7 in. above the track, and with the overcutter type from 37 to 51 in. above the track, both with 16-in. wheels. Normal wheelbase is 47¼ in., and track gages range from 30 to 48 in. Maximum height adjustment at each front wheel for tilting is 6 in.

Sullivan also offered for inspection the CR-8 room-and-pillar cutter equipped with the pulsing-power feed, which it declares offers much higher power with a simplified design (one-half as many gears). Other features cited by the company include: complete reversibility simply by resetting the bits; independent drum control; tilting or tip-turn type trucks driven through reversing friction-controlled gearing; and conveniently grouped controls. Both a.c. and d.c. types, open or government-approved equipment, are available, with the following specifications: weight, 6½-ft. bar, d.c. motor, 5,900 lb.; over-all length, excluding bar, 63½ in.; width, 64¾ in.; height, cutting, 23½ in.; kerf thickness, 3, 4, 5 or 6 in.; cutter-bar length, 5½, 6½, 7½ or 8½ ft.; cutting feed, 0-33 or 0-66 in. per minute; fast, or retreating, feed, 40 ft. per minute; tramming speed, 0-440 or 0-660 ft. per minute.

Cincinnati Mine Machinery Co., Cincinnati, Ohio, displayed the Cincinnati "Duplex" cutter chain, consisting of the "Duplex" bit, one-piece holder and "Duplex" bit block. Increased production, coarser cuttings, greater safety and two to six times longer life, according to the company, result from the following features: use of high-grade, precision-heat-treated, rigidly inspected alloy tool steel for the bits; perfect shape; easy setting (holder released by one-quarter turn of screw); uniform gage; elimination of resharpening (bits are scrapped when both points are worn down); minimum weight (slightly over

Above, Sullivan CA-14 Track-Mounted Cutter; Below, Sullivan CR-8 Room-and-Pillar Cutter With "Pulsing Power" Feed





Cincinnati "Duplex" Bit and Holder

1 oz. per bit) with great strength, thus reducing transportation problem; use of durable, heat-treated alloy-steel holder; and effective locking arrangements to prevent bit loss. The Cincinnati company also displayed cutter heads, chains, sprockets and bit wrenches for mining machines.

Chicago Pneumatic Tool Co., New York, in addition to items from its line of CP pneumatic drills, "Little Giant" mounted and portable electric coal drills and tools for mine-car and maintenance work, coal augers and the CP (Quimby) portable pneumatic sump pump, demonstrated a telescopic feed for use on mounted electric coal drills. With this feed, the front end of the thread bar is not threaded, and the bar is inclosed in telescoping cylinders so that the threads never are exposed even when the bar is fully extended, thus eliminating this source of injuries. Another safety feature is a totally inclosed feed nut. Chicago Pneumatic also offered the new No. 327-C-450 rotary-type non-reversible pneumatic coal drill with an over-all length of 17½ in., a running speed (light) of 450 r.p.m. and a weight of 27½ lb.

Timken Roller Bearing Co., Canton, Ohio, displayed the Timken detachable rockbit. Bethlehem Steel Co., Bethlehem, Pa., offered pneumatic drill steel.

Increasing Transportation Efficiency

MINE CARS, wheels, hoists and track materials were the principal items featured at Cincinnati by manufacturers of transportation equipment. General Steel Castings Corporation, Eddystone, Pa., offered the "Commonwealth" cast-steel car built for the Jewell Ridge Coal Corporation and embodying a one-piece cast-steel body with a one-piece cast-steel end-gate. With a capacity of 127 cu.ft., or 4½ tons, of coal, weight of the car complete is 4,200 lb., or 33 lb. per cubic foot. The car, equipped with the Bonney-Floyd cast-steel Timken-bearing wheel assembly (12-in. wheels) and spring bumper, includes a total of 30 parts: cast-steel body, end-gate, two bumper caps, two end-gate hinge bolts, eight bumper springs, four bumper bolts, four axles, four axle retainer bolts, and four wheels. Principal dimensions are as follows: Inside width, 6 ft.; inside length, 11 ft. 8 in.; height over rail, 30 in.; length over bumpers, 13 ft. 1½ in.

In addition to wheels and other mine-car specialties, Watt Car & Wheel Co., Barnesboro, Ohio, displayed an all-steel stub-axle mine car with Miner draft and buffing gear. Capacity of this car, designed for rotary-dump operation, is 125 cu.ft., an increase of 35 cu.ft. over an older type with the same dimensions—height, 45 in.; over-all width, 63 in.; inside length, 96 in.; over-all length, 116 in. Sides inflared at the top to allow the roll to be formed without decreasing dimensions was a feature pointed out by the company. Wheels (16-in.) are Timken-bearing equipped.

Enterprise Wheel & Car Corporation, Huntington, W. Va., showed the all-steel four-axle car with a capacity of 63 cu.ft. and a weight of 3,269 lb. built for the Wells-Elkhorn Coal Corporation. Height is 21 in.; inside width, 72 in.; inside length, 120 in.; over-all length, 144 in. Wheels, links and pins completed the company's display.

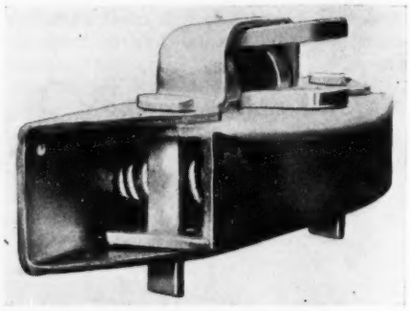
Lorain Steel Co., Johnstown, Pa., displayed an all-welded mine car for the United States Coal & Coke Co. with a capacity of 102 cu.ft., featuring the use of ⅞-in. "Cor-Ten" steel, a new product being developed by the American Sheet & Tin Plate Co. and the Carnegie Steel Co. Cor-Ten is described as a low-chromium-alloy steel with high strength and resistance to corrosion (four to six times that of ordinary carbon steel and two to three times that of copper-bearing steel under atmospheric conditions). A substantial decrease in weight with equal strength is stressed by the company.

Mine cars manufactured by the Phillips Mine & Mill Supply Co., Pittsburgh, Pa., were represented by their photographic likenesses, and the company also displayed wheels, hitchings and mine-car parts. Sanford-Day Iron Works, Inc., Knoxville, Tenn., employed models to show the operation of its bottom-dumping cars and demonstrated the Sanford-Day roller-bearing mine-car wheel, using Fafnir roller bearings. Baldwin Locomotive Works, Philadelphia, Pa., also employed photographs to present various types of Baldwin-Westinghouse mine locomotives.

Duncan Foundry & Machine Works, Alton, Ill., demonstrated the effect of correct and incorrect wheel-boring methods on wheel alignment with anti-friction bearings and displayed mine-car wheels said to be stronger and longer-wearing through the use of electric-furnace cast iron, as well as samples from the company's line of electric-steel castings for all purposes.

"Naco" mine-car wheels and hitchings and the Willison automatic coupler and draft gear were displayed by the National Malleable & Steel Castings Co., Cleveland, Ohio.

Jeffrey Mfg. Co., Columbus, Ohio, exhibited a new cast-steel brake shoe with chrome-iron inserts in the flange and tread, said to reduce wear and increase life. The lip of the flange is brought down even with the tread to keep the shoe in proper position on the tread



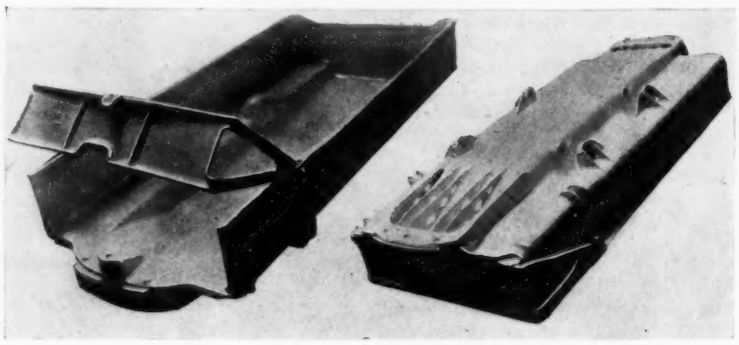
Bethlehem Draft and Buffing Gear

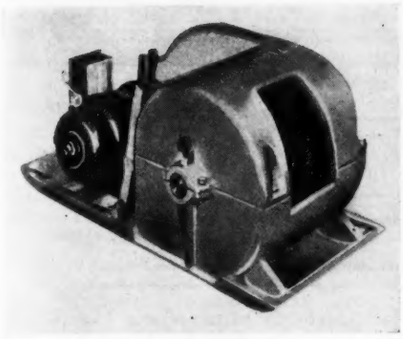
even when the brake rigging is loose. Locomotives manufactured by the company were presented through a photographic display.

W. H. Miner, Inc., Chicago, offered the D-type draft and buffing gear for double-bumper mine cars, the SL-type for other types of cars and the new Class T-3 friction draft gear and special-heat-treated lightweight coupler as applied to 200 Lehigh Navigation Coal Co. mine cars. The Class T-3 gear, according to the company, is an adaptation of the standard friction-type draft and buffing gear used by railroads.

Bethlehem Steel Co., Bethlehem, Pa., offered a newly developed forged-steel spring draft and buffing gear for all-steel mine cars or cars with steel underframes. Bethlehem also showed wrought-steel wheels for mine cars,

Top and Bottom Views of the "Commonwealth" Cast-Steel Mine Car





Flood City Room Hoist

forged-steel coupling links, its complete line of steel ties for mine tracks and switch throws.

Brown-Fayro Co., Johnstown, Pa., in addition to the Model Hkc car-spotting hoist, rerailers, and Timken-bearing track sheaves, mine-car wheels and track rollers, offered for inspection a web-type car wheel. A double web is used instead of spokes, thus, according to the company, reducing weight while still retaining strength and wearing qualities, due to the fact that both the depth and the location of the chill can be definitely controlled. The Brown-Fayro exhibit also included nickel-chrome-steel pump parts for longer wear and greater resistance to corrosion; all-bronze and high-lead bronze foot-valves and strainers; cast-iron and bronze "Multiport" check valves; beetle-back strainers; and the Austin-Brownie 5x6-in. permissible pump.

Steel mine ties and wrought-steel wheels for mine cars and locomotives formed part of the display of the Carnegie Steel Co., Pittsburgh, Pa. Weir-Kilby Corporation, Cincinnati, Ohio, showed frogs, switch throws and track supplies.

Flood City Brass & Electric Co., Johnstown, Pa., offered a new 5-hp. completely inclosed room hoist of the friction-clutch type. Weight complete with motor is 1,140 lb. Length is 46 in.; width, 25½ in.; height, 21¼ in. With a car resistance of 30 lb. per ton, the 5-hp. hoist will develop a rope pull of 1,200 lb. at 140 ft. per minute, according to the company, and will handle loads varying from 40 tons on the level to 4 tons on a 15-per cent gradient. Rope capacity is: ½-in., 675 ft.; $\frac{7}{16}$-in., 880 ft.; ⅝-in., 1,175 ft. Both open and permissible types for 250 and 500 volts, d.c., and 220-440 volts, a.c., are available.

Sullivan Machinery Co., Chicago, displayed the new RHE-5 room hoist, said to be a compact, strong, single-drum electric hoist especially adapted to handling cars in room work, but also suitable for other pulling service.

West Virginia Rail Co., Huntington, W. Va., offered for inspection switches, steel ties, switch stands and throws, including a special steel switch tie which can be used for either right- or left-hand turnouts and is made to suit any type of switch stand, as well as a special switch stand for use with steel ties.

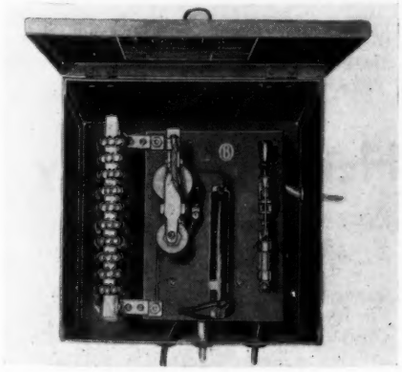
Nachod & U. S. Signal Co. and the Cheatham Electric Switching Device Co., Louisville, Ky., showed Nachod signaling and indicating equipment, the Cheatham automatic electric switch-thrower operated by a trolley contactor, and "Reflex" (reflecting) trip markers. New items in the Nachod line included a switch-position indicator and an MS signal with the lights and control relays built into the same cases.

Jeffrey-Traylor division, Jeffrey Mfg. Co., offered a display built around the Colorado-type hoisting signal system.

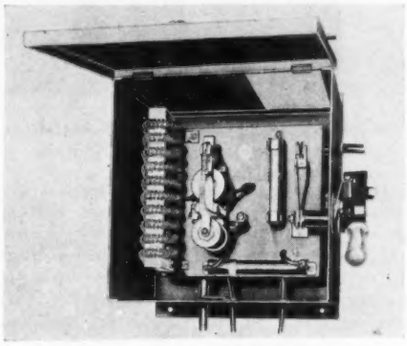
Cost-Cutting Electrical Equipment

EFFICIENT distribution, use and control of power was the keynote of the exhibits of manufacturers of electrical equipment at the Cincinnati exposition. In addition to rail bonds and welding equipment, overhead trolley and feeder materials of all kinds, current collectors for locomotives, trolley taps, locomotive headlights, safety switches, junction boxes and other products, the Ohio Brass Co., Mansfield, Ohio, offered four new d.c. starters for mining applications. A feature of these starters is the use of a relay to throw the motor across the line at the proper time. When the starting impulse is given, the motor starts on resistance, the armature current passing through the hold-out coil of the relay, which is in series with the armature. The main relay coil is in parallel with the armature and also is energized as the switch is closed, thus tending to close the running contactor. This tendency, however, is opposed by the pull of the hold-out coil. As the motor comes up to speed, the current in the hold-out coil decreases while the current in the main coil increases, finally closing the contactor and cutting out the resistance. Generally, the winding of the hold-out coil serves as the starting resistance, though a separate resistance is provided for larger horsepowers with certain types.

Ohio Brass Type KD Motor Starter



Of the four types employing the above principle, Type KD is a hand-operated knife-switch-style starter for 2½ to 7½ hp., 250 and 600 volts, the knife switch being equipped with a quick-break feature for stopping. Overload and short-circuit protection is obtained by the use of the proper-sized fuse, and the starter operates on the no-voltage release principle, the relay opening upon power interruption and the motor automatically starting on resistance when service is resumed. The starter mechanism is mounted in a steel case and the lid must be raised to manipulate the starting switch. The Type KSD starter for 2-

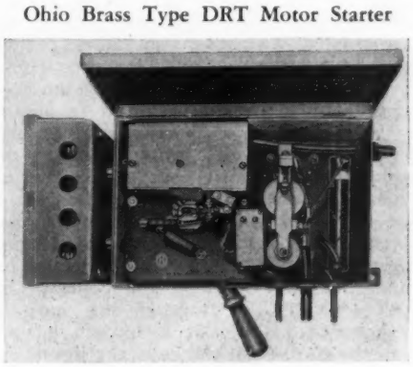


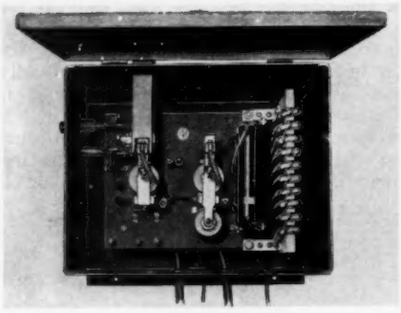
Ohio Brass Type KSD Motor Starter

to 15-hp. motors is similar to the Type KD equipment with the exception that the switch is operated by a quick make-and-break handle on the outside of the case, the lid being interlocked with the handle. For larger motors, the hold-out coil is copper-wound and a separate nichrome resistance is mounted on the panel.

The Type DRT starter is offered for 2- to 50-hp. motors, 250 volts, and is a hand-operated type with a circuit breaker for starting and stopping. It includes thermal overload protection adjusted for overloads of 25 per cent for 3 minutes. When the starter trips after an overload it must be operated again by hand. No-voltage release operation is similar to that of the KD and KSD starters. Starting resistance on the larger sizes is mounted in a separate case. The Type AD starter for 2- to 50-hp. motors, 250-600 volts, is of the contactor type, line and resistance contactors being employed for cutting out starting resistance. Like the DRT starter, this operation is timed automatically. Thermal-overload protection is similar to that employed in the DRT starter, and short-circuit protection is provided on the line contactor. Two separate hook-ups are provided for either no-voltage release (the motor starting automatically on resistance upon resumption of service) or no-voltage protection (restarting must be done by hand). Full-automatic or pushbutton control is available, the

Ohio Brass Type DRT Motor Starter





Ohio Brass Type AD Motor Starter

latter in two forms—pushbutton on the starter case, either no-voltage release or no-voltage protection; or remote control, three-wire station with no-voltage protection or two-wire station with no-voltage release. Starting resistance may be included in the hold-out coil or mounted separately. The AD starter is designed for use on shunt-field or compound-wound motors for fans, pumps, compressors, etc.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., featured in its display an uphill shaker-conveyor controller accelerating a motor from 400 to 1,000 r.p.m. and retarding it from 1,000 to 400 r.p.m. 65 times per minute, and in connection with the exhibit showed a special Type SK, Frame 63, d.c. motor for this service. Other Westinghouse products on display included: Class 11,-200 linestarters, floodlights, Type TA industrial analyzers *(Coal Age*, October, 1933, p. 359); an AB "De-Ion" circuit breaker, permissible headlights, time starters for mining service, gearmotors, Type CS induction motors, brushes, electrical parts for mining equipment, armature and field coils, insulating materials, trolley and overhead line material, and splash- and weather-proof motors.

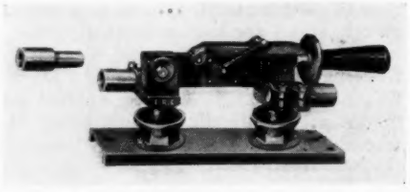
General Electric Co., Schenectady, N. Y., featured fan-cooled, splashproof and standard motors and controls, double-reduction gearmotors, laboratory products and a complete cable display stressing GE Tellurium-compound rubber.

National Carbon Co., Cleveland, Ohio, offered carbon brushes for mining and industrial service, particularly 869 and AX-5 grades for mine locomotives, AYK grade for slip-rings and 234 grade for the d.c. side of rotary converters, as well as the new "Noxide" contact material. The latter, according to the company, was developed primarily for contact service where severe arcing occurs, and consists of a carbon block impregnated with a special alloy, which snuffs out the arc much faster and prevents oxidation and heating of the copper contact. As a result, it is impossible to freeze a Noxide and copper-tip combination, according to the maker, and the necessity for changing contacts frequently is eliminated.

Jeffrey Mfg. Co., Columbus, Ohio, offered a new trolley harp and socket equipped with a centering spring for automatically aligning the collector on the wire. The top of the harp is shrouded to present a smooth surface to the roof when the collector jumps the wire. Both malleable-iron and brass types are available and the clamp terminal is arranged to take various sizes of wire. Jeffrey also displayed a new automatic transfer switch for locomotives with a blow-out coil on the cable-reel side to act as a safety switch. In case the controller becomes inoperable, power can be cut off the locomotive by opening a snap switch, which in turn operates the blow-out coil, the blow-out extinguishing the arc. Jeffrey also offered locomotive blowers *(Coal Age*, March, 1934, p. 117) and items from its line of electrical and mechanical repair parts for mining equipment, including a split case for split-frame locomotive motors which, it is said, does not have to be unbolted from the motor frame, thus facilitating removal.

Robinson Ventilating Co., Zelienople, Pa., offered blowers for mine locomotives in various styles and sizes.

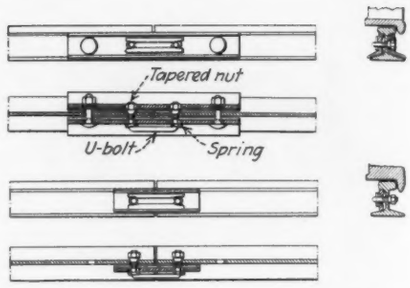
In addition to items from its line of overhead trolley and line material, Electric Railway Equipment Co., Cincinnati, Ohio, exhibited the new "E.R.E." quick-break feeder switch rated at 100 to 2,000 amp. This switch is mounted



"E.R.E." Quick-Break Feeder Switch

on a steel channel with two standard mine hangers as insulators, and is said to eliminate the breakage frequently encountered in installing switches mounted on slate bases. Other features include a soldered-type split-clamp terminal which gives full contact over the entire capacity of the connection and a 1,000-volt rubber handle fitted with a fiber guard.

Bertrand P. Tracy Co., Pittsburgh, Pa., displayed the new "Dual-Duty" rail bond designed primarily for use on room track or as a temporary repair or standby unit in permanent and semi-permanent tracks. This bond is offered for inclusion in the regular tracklaying procedure, and consists of a tool-steel U-bolt, a flat steel spring and two tool-steel tapered nuts. Application methods are shown in the accompanying illustration, and the company states that when the tapered nuts are screwed down tight the very high pressure over the small circular contact area forces out oxides and insures maximum contact, which is maintained by the pressure of the spring over long periods in the presence of water and other corrosive or oxidizing agents. The absolute contact and immediate expansion of area on either side, it is said, gives the effect of a large contact area. The Dual-Duty bond is available in sizes for 20- to 80-lb. rail.



Two Methods of Applying "Dual-Duty" Rail Bond

Brown-Fayro Co., Johnstown, Pa., exhibited the new Model SDP explosion-tested switch for use on pit-car loader, hoist and other across-the-line starting motors.

Post-Glover Electric Co., Cincinnati, Ohio, offered for inspection P-G motor starters for fans and pumps, resistors for cable reels and mining machines and locomotives, change-over switches for haulage locomotives using two trolley poles and transfer switches for cable-reel locomotives.

Armature and field coils for mining equipment, including a Bakelite-treated field coil, and electrical insulating material were displayed by the Pennsylvania Electrical Repair Co. and the Close Distributing Co., Pittsburgh, Pa. Electric Railway Improvement Co., Cleveland, Ohio, offered "Erico" arc-welded bonds and welding equipment.

"Everlast" and "Penmaco" rail bonds were shown by the Penn Machine Co., Johnstown, Pa., and the Flood City Brass & Electric Co. displayed bonds, trolley supplies and a field-coil testing machine.

Electric Storage Battery Co., Philadelphia, Pa., offered various types of Exide "Ironclad" cells for mining and industrial batteries. Thomas A. Edison, Inc., West Orange, N. J., exhibited nickel-iron-alkali cells for mining and industrial service, as well as Edison electric cap lamps.

Insulated wire and cables, magnet wire, lead-covered cables, rail bonds, trolley and feeder wire, and other types of electrical conductors were shown by the John A. Roebling's Sons Co., Trenton, N. J. American Steel & Wire Co., Chicago, offered "Amerclad" all-rubber insulated cables, rail bonds of all types and borehole cable-suspension clamps. Simplex Wire & Cable Co., Boston, Mass., displayed samples from its line of electrical cables, stressing types for special services.

Preparation Systems Heighten Quality

SEVENTEEN manufacturers of preparation equipment and products exhibited at the Cincinnati exposition. American Sheet & Tin Plate Co., Pittsburgh, Pa., displayed round-hole and slotted stainless-steel screen jackets. Columbia Alkali Co., Barberton, Ohio, offered "Col-Rec" coal-treating compound *(Coal Age*, October, 1933, p. 359).

With the statement that a square opening will pass oversize because of the long diagonal dimension and that an equivalent round opening will give greater accuracy but not sufficient ca-

pacity, Hendrick Mfg. Co., Carbondale, Pa., offered "Sqround Mesh," a square opening with fillets in the corners to prevent the passage of oversize. Hendrick also displayed a mechanical coal and aggregate tester, sieves in the coal size being 22 in. square and capable of screening a sample of 50 lb. in 1½ to 2 minutes, according to the company. Other Hendrick products included: milled-slot screen plate; short-slot lip screens for dewatering very small sizes; oval-, side- and end-staggered plate; Perisertread plate; all-bronze screen plates; diagonal-slot dewatering screens; square- and round-hole plates; "Mitco" interlocking grates; and the "Mitco Shur-site" stair tread.

Hydrotator Co., Cleveland, Ohio, by means of a working model, showed the operation of the air-sand coal-cleaning process. Jeffrey Mfg. Co., Columbus, Ohio, employed a pictorial display to present its preparation service and showed Jeffrey "Flextooth" and single-roll crushers. Jeffrey-Traylor division exhibited an electric vibrator and the vibrator conveying system. Koppers-Rheolaveur Co., Pittsburgh, Pa., explained the chief points of Rheolaveur washers, Birtley dedusters and Waring dust collectors diagrammatically, and displayed wedge-wire sieves.

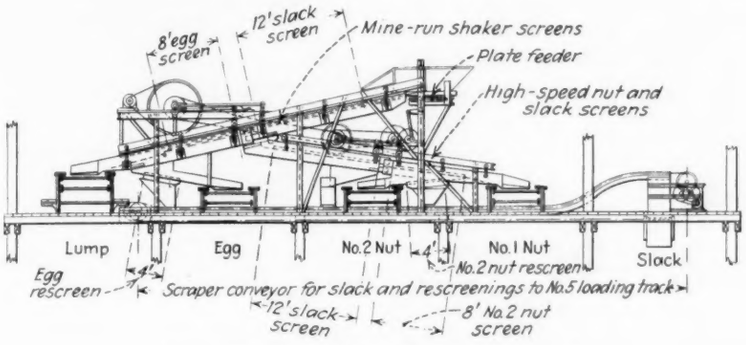
Link-Belt Co., Chicago, exhibited an operating model of the Link-Belt-Simon-Carves coal-washing system, a herringbone-gear speed reducer from its line (in operation), samples of chains, belt-conveyor idlers and other products, as well as the Link-Belt domestic stoker (p. 256 of this issue).

Construction and operation of the "New Black Diamond" coal crushers were explained diagrammatically at the booth of the McLanahan & Stone Corporation, Hollidaysburg, Pa. Features pointed out by the company included: automatic "Steelstrut" toggle; all-steel working parts; tramp-iron protection; instantaneous hand-wheel adjustment while the crusher is in operation; large capacity; uniform product; and maximum reduction in one operation.

The Norton washer and the new Norton vertical pick breaker *(Coal Age,* April, 1934, p. 155) were featured by the McNally-Pittsburg Mfg. Corporation, Chicago.

A model of a self-contained shaker-screen installation combining in one unit a slow-speed shaker for lump and egg; a high-speed shaker for nut, pea and slack; rescreens; and a slack conveyor was shown by the Morrow Mfg. Co., Wellston, Ohio. This unit, the company points out, was designed to permit installation in an existing structure, if necessary, without extensive rebuiding, and may be supported separately. The slow-speed screen also was designed for use with three-, four- or five-track layouts, thus allowing preliminary installation of the slow-speed unit (95-100 strokes per minute) and later addition of the high-speed unit (140-175 strokes per minute). Rescreens are installed in the reverse-direction chutes leading to the booms.

A Stumpf "Air-Flow" coal cleaner and a "Ro-Sieve" screen were displayed by the Roberts & Schaefer Co., Chicago, in addition to diagrammatic explanations of the construction and operation of the Menzies hydroseparator and the Wuensch "Differential-Density" coal-cleaning process.



Morrow Self-Contained Shaker-Screen Unit

Robins Conveying Belt Co., New York, presented a flowsheet of a typical bituminous coal-preparation plant employing Chance cones for washing and displayed "Super-Gyraloy" screen cloths and the Robins "N-D-Seal" conveyor roll (p. 240). John A. Roebling's Sons Co., Trenton, N. J., offered various types of woven-wire fabrics and screen cloths.

Streeter-Amet Co., Chicago, demonstrated the application of the Streeter-Amet Type MT-14 weight recorder to gravity weighing of mine cars and explained also application of the recorder to weigh pans and baskets and to weighing cars coupled in trips.

Sun Oil Co., Philadelphia, Pa., displayed water-emulsifying "Coalkotes" A and B for dustless treatment of solid fuels, and offered the new non-freezing "Coalkotes" C and CB. "Coalkote" C, according to the company, is a clear petroleum oil which will pour readily at 30 deg. below zero and may be applied direct by high-pressure fine spray or atomization. It is said to be non-corrosive, odorless and inexpensive, average treatment requiring three or four quarts per ton. "Coalkote" CB is offered as a specially compounded dark product with a below-zero pour point. It is applied in the same manner as "Coalkote" C and is adapted to treatment of fuel that may be exposed for several months.

Toledo Scale Co., Toledo, Ohio, exhibited a Toledo mine-car printing scale with an inbuilt sealed-weight unit for testing purposes, full-floating suspension to relieve the knife edges of wear due to vibration and oscillation, easily replaceable tool-steel pivots and bearings, and a quick-change tare-setting mechanism. A feature of the exhibit was a demonstration of the Toledo "Printweigh" with selective numbering keyboard *(Coal Age,* December, 1933, p. 433) for printing on a tape the hour of trip arrival, section from which the trip came, miner's check number, weight of the coal and other necessary information.

W. S. Tyler Co., Cleveland, Ohio, offered the Type 400 vibrating screen with improvements designed to increase efficiency and simplify operation. Vibrators, one on each corner of the screen, are now designed so that by lifting the cover plates the field coils and steel wearing plates are exposed, thus allowing the entire screen-cloth supporting structure to be lifted out of the machine. The spring arrangement also has been changed, the company points out, to eliminate hand-wheel adjustment in favor of shimming on the "stroke spring." With this arrangement, it is said, the screen cloth can be changed at any time without affecting the vibrator adjustment. The Tyler exhibit also included the "Thermionic" control for securing higher-than-usual screening intensities.

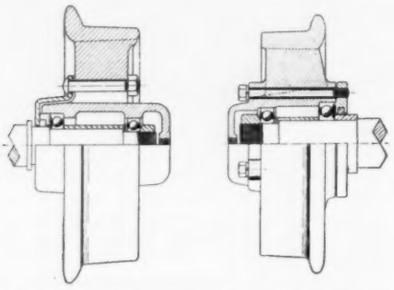
Industry Offers Coal-Mining Aids

MANUFACTURERS of bearings, lubricants, wire rope and other staples and specialties for the mining industry comprised a substantial proportion of the exhibitors at the Cincinnati exposition. Ahlberg Bearing Corporation, Chicago, displayed Ahlberg ground and CJB bearings for mining and industrial equipment, emphasizing the fact that all mine sizes now are equipped with all-bronze instead of pressed-steel retainers, resulting in a sturdier construction for heavy-duty service.

Fafnir Bearing Co., New Britain, Conn., exhibited Fafnir ball bearings for fans and blowers, pumps, motors, cutting machines, conveyors and loading machines, drills, locomotives, hoisting equipment, compressors, preparation machinery and other mining equipment, including mine-car-wheel applications. Features of the wheel design, according to the company, include: large balls, deep races and sturdy construction for ample thrust and radial capacity; fully inclosed outer bearing housing, eliminating leakage; perfect closure at inner bearing provided by metal seal, felt seal and housing cap; large lubricant space, making lubrication infrequent; reduction in power consumption, due to ability to take severe side thrust on rolling surfaces; lubricant saving, resulting from sealing and housing methods used; easy removal; full-load capacity; and simple assembly.

New Departure Mfg. Co., Bristol, Conn., offered "Lubricated-for-Life"

mine-car bearings and "N-D-Seal" bearings for conveyor rolls, in addition to sheave bearings and other mining and industrial types. The mine-car type consists of two rolls of balls spaced wide apart and preloaded to assure even greater rigidity than with two bearings spaced the usual distance apart. The



Fafnir Ball-Bearing Mine-Car Wheels

bearings are completely lubricated with a special grease and thereafter are permanently sealed on both sides, with the result, it is stated, that they may be handled at any time without danger from the entrance of dirt. No further attention for lubrication or adjustment is required, according to the company, and the extreme width of both inner and outer rings allows a loose fit on the axle, with the result that a worn wheel may be removed quickly and a new wheel substituted by removing three nuts. Additional seals are provided where the cars continually encounter water.

Permanent sealing, life-time lubrication, elimination of all separate closure parts and lubrication fittings, simplicity and ease of assembly and disassembly of conveyor-roll units are the principal advantages claimed for the N-D-Seal bearing, in addition to elimination of adjustment and misalignment.

"Precision" ball, roller and thrust bearings for mining and industrial service were displayed by the Norma-Hoffmann Bearings Corporation, Stamford, Conn., as well as self-aligning ball- and roller-bearing pillow blocks and solid-bronze-retainer bearings.

Timken Roller Bearing Co., Canton, Ohio, displayed Timken tapered roller bearings for mining and industrial equipment, with particular attention to mine-car applications. Tyson Roller Bearing Co., Canton, Ohio, offered Tyson "Cageless" tapered roller bearings.

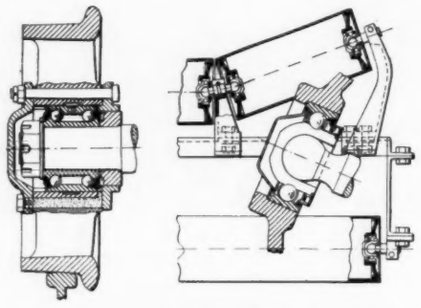
In addition to its other industrial and motor oils and lubricants, Gulf Refining Co., Pittsburgh, Pa., exhibited a special waterproof mine-car grease; Lubcote No. 1, for lubricating and covering the strands of wire rope to prevent corrosion and reduce internal friction; and the "Gulfpride" series of lubricants, for heavy transmissions.

Hulburt Oil & Grease Co., Philadelphia, Pa., was represented by its complete line of mining greases. National Carbon Co., Cleveland, Ohio, displayed "Gredag" lubricants. Pure Oil Co., Chicago, offered examples of its line of mining and industrial oils and greases. Standard Oil Co. of Indiana, Chicago, exhibited its line of lubricants for all purposes.

Sun Oil Co., Philadelphia, Pa., presented mining and industrial lubricants of all types, and the Texas Co., New York, displayed "Texaco" products for all services. "Tulc" mining lubricants were shown by the Universal Lubricating Co., Cleveland, Ohio, in conjunction with the display of the Post-Glover Co.

In addition to photographic displays of aerial tramways, items from its line of wire rope, special hoist and mining-machine feed ropes, and Fiege "Tiger-Claw" rope sockets and fittings, American Steel & Wire Co., Chicago, showed a new locked-coil track cable for aerial tramways which, it pointed out, has the highest strength ever attained in a locked-coil construction. "Lay-Set" and "Tru-Lay" preformed wire rope for mining service was displayed by the Hazard Wire Rope Co., Wilkes-Barre, Pa. A. Leschen & Sons' Rope Co., St. Louis, Mo., exhibited Leschen "Red-Strand" wire rope.

Macwhyte Co., Kenosha, Wis., brought out the fact that its Monarch "Whyte-Strand" wire rope now is internally lubricated with a new type lubricant which does not flow at 200 deg., against 120 deg. with the old type,



New Departure Mine-Car Wheel and "N-D-Seal" Conveyor Roll

and does not thicken down to zero, thus supplying increased resistance to heat, cold, water and ordinary acids, and internal friction. The Macwhyte Co. also offered the new Atlas "Multiple-Part" sling, formed of two endless wire-rope elements, one left and the other right lay, which are spirally interwoven in such a manner as to run the full length of the sling, divided into ropes of opposite lays. Extreme strength and maximum flexibility are claimed for it, in addition to lack of a tendency to kink.

Roebling "Blue Center" wire ropes, flat wires and special-shaped wires, hitchings, clips, thimbles, clamps, sockets and rope slings were shown by the John A. Roebling's Sons Co., Trenton, N. J., in addition to the "No-Pinch" wedge socket *(Coal Age,* December, 1933, p. 433).

Gears and pinions for mining equipment were shown by the Tool Steel Gear & Pinion Co., Cincinnati, Ohio. Flood City Brass & Electric Co., Johnstown, Pa., offered brass and bronze bearings for mine machinery, and impellers for centrifugal pumps. Bertrand P. Tracy Co., Pittsburgh, Pa., displayed parts for mining equipment, and the Penn Machine Co., Johnstown, Pa., exhibited a new geared feed drum for Goodman shortwall mining machines in both ball- and roller-bearing types, as well as brass, bronze and white metal bearings, SKF bearings, steel gears and pinions, pump impellers and "Pencoid" composition oil- and waterproof silent pinions.

Carnegie Steel Co., Pittsburgh, Pa., offered steel roof supports for mine use, and the Lorain Steel Co., Johnstown, Pa., displayed Langham mine-post jacks and timber jacks. Lincoln Electric Co., Cleveland, Ohio, and the R. D. Eaglesfield Co., Cincinnati, Ohio, displayed Lincoln "Shield-Arc" welders. National Carbon Co., Cleveland, offered welding gases and equipment and carbon pipe for mine service. Central Foundry Co. "Universal" cast-iron pipe was displayed at the Post-Glover booth.

Treated timbers and treating materials formed the exhibit of the Wood Preserving Corporation, Pittsburgh, Pa. Princeton Foundry & Supply Co., Princeton, W. Va., demonstrated the "Perfection" cone-stove sand dryer with a capacity of 12 tons per day in the standard size and using, according to the maker, approximately 30 lb. of coal per ton of dry sand. "Hall's" improved shaker grates also were shown by the Princeton company.

Other exhibitors included the Coal Mine Equipment Sales Co., Terre Haute, Ind.; Deming Co., Salem, Ohio; Ingersoll-Rand Co., Phillipsburg, N. J.; and the Pittsburgh Knife & Forge Co., Pittsburgh, Pa.

New Products Increase Safety

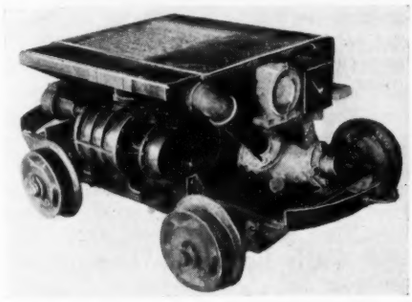
AS IN PAST YEARS, products and equipment for safe operation of coal mines formed an important part of the Cincinnati exposition. Mine Safety Appliances Co., Pittsburgh, Pa., in addition to safety shoes, first-aid kits and supplies, inhalators, American Optical Co. goggles, permissible mine-rescue breathing apparatus, Skullgards of various types, Edison cap, hand and trip lamps; hand guards for timbermen, shot-firing units, car stops, safety lamps, lamp-charging equipment, all-service gas masks, methane and carbon-monoxide detectors and indicators, and other safety equipment, offered the "Comfo" respirator for mining and industrial service, said to feature comfort, low breathing resistance and ability to filter out particles down to micron size.

Safety First Supply Co., Pittsburgh, Pa., displayed protective headgear, safety shoes, respirators, Willson goggles and other safety supplies, and also exhibited a new line of playground apparatus, in addition to demonstrating the Bullard "Siracode" mechanism for use on Bullard "Signal-Master" sirens to transmit coded signal calls. Max Wocher & Sons Co., Cincinnati, Ohio, offered first-aid materials and health-preserving equipment.

Lehigh Safety Shoe Co., Allentown, Pa., was represented by a full line of

safety footgear, featured by the inclusion of a leather insole in rubber footwear to prevent sweaty feet and rolling of the insole, thus promoting comfort, and by the addition of dress shoes and oxfords to the Leather-Wear line and the expansion of the range of widths to give the wearer a choice from A to E.

Portable Lamp & Equipment Co., Pittsburgh, Pa., offered Wheat electric cap lamps, together with the "cafeteria"



"Little Giant" Rock-Dust Distributor

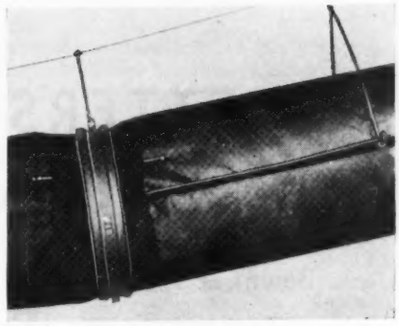
charging system, Wheat trip lamps and hand lamps, Kohler safety lamps, safety shoes and boots, goggles, the "Cool-Cap," soft-rubber knee pads and other safety equipment. National Carbon Co., Cleveland, Ohio, exhibited U.C.C. methane detectors and permissible flashlights. Robinson Ventilating Co., Zelienople, Pa., offered a pictorial display of fan installations and exhibited a portable "man-cooler" for use in hoisting rooms, shops, etc. Jeffrey Mfg. Co., Columbus, Ohio, had a 4-ft. "Aerovane" fan in operation on the exposition floor.

American Mine Door Co., Canton, Ohio, offered the new "Little Giant" rock-dust distributor with a hopper capacity of five sacks. Ease of movement, sufficient but not excessive capacity for smaller operations and adaptability to use in places where a larger machine cannot enter are advantages pointed out by the company, in addition to the fact that a control gear affords two operating speeds giving a discharge ranging from 65 lb. with a 50-ft. hose to 40 lb. with 100 ft. of hose. Nozzle design also is emphasized by the company, the air and dust flowing through concentric channels into a mixing chamber where the dust is thoroughly mixed into the air stream, thus facilitating the handling of the heaviest dust. The control also is said to give a vibratory effect which prevents arching and sticking of the dust in the hopper. Height of the unit is 27 in. over the rail and the over-all length is 7 ft. It is available with either open or permissible equipment in usual track gages.

American Brattice Cloth Co., Warsaw, Ind., in addition to various types and grades of "Mine-Vent" ventilating tubing and brattice cloth, including three grades of fireproof duck for brattice purposes in addition to the three regular grades, demonstrated demountable "Mine-Vent" couplings with an improved retaining ring having a projection, as shown in the accompanying illustration, to facilitate uncoupling.

The Sullivan - Airdox method of breaking down coal by the use of a compressed-air cartridge with controllable-pressure features was demonstrated by the Sullivan Machinery Co., Chicago. The cartridge (52x3 in.; weight, 27 lb.) is inserted in the drill-hole, tamped in the usual manner, and connected to the compressor, a Sullivan Class WK-44 four-stage unit capable of supplying pressures up to 12,000 lb. per square inch, by high-pressure metallic tubing. The air charge is varied in accordance with the seam and when the proper pressure is reached, the compressor is shut off and the air line vented, whereupon back pressure in the cartridge closes the admission valve and opens the discharge valve, thus releasing the air through ports at the back end of the cartridge.

Substantial increases in lump percentages due to the heaving, rather than shattering, action of the discharge is one of the major advantages emphasized by the company, together with the elimination of sparks and flames, fumes and shattering of the roof. The compressor is available with either open or permissible equipment and in track gages from

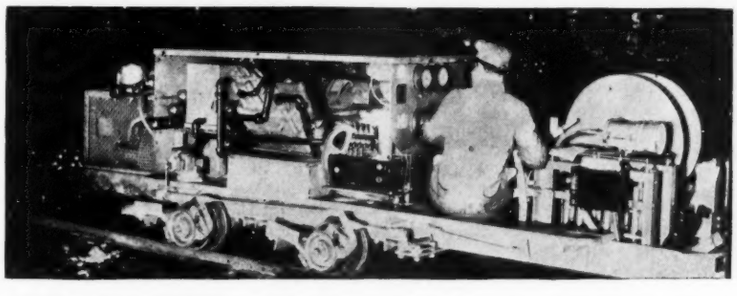


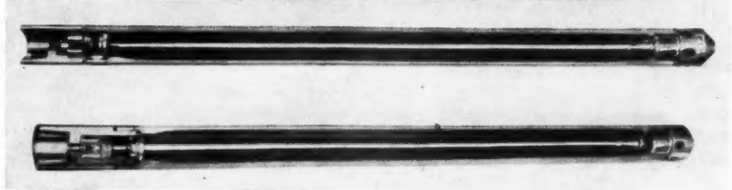
"Mine-Vent" Tubing Coupling

36 to 56½ in. With 12-in. wheels, height of the unit is 48⅝ in.; over-all width, 5 ft. 3½ in.; over-all length, 15 ft. 5 in.; wheelbase, 42 in.; weight, net, 9,070 lb. The entire blasting operation is controlled from the operative's station on the compressor. The cartridge is recovered after each blast and can be used again without adjustment or renewal of parts.

"Blackstix" for blasting coal and the "Accordion-Fold" electric blasting cap were offered by the Atlas Powder Co., Wilmington, Del. E. I. duPont de Nemours & Co., Inc., Wilmington, featured pellet powder for coal-mine use. General Explosives Corporation, Latrobe, Pa., displayed its line of explosives and offered the safety-container electric blasting cap, consisting of a cardboard container perforated around the middle to allow it to be opened by a quick twist in the hands. Explosives, detonators and blasting machines were shown by the Hercules Powder Co., Wilmington. Liberty Powder Co., Pittsburgh, Pa., featured its line of coal-mine explosives and also displayed Western Cartridge Co. "Protect-O-Spool" blasting caps.

In addition to other safety displays, the National Committee of the American Mining Congress on the U. S. Bureau of Mines took a booth to show by statistical and pictorial exhibits the place of the bureau in the mining industry of the country.





Above, "Airdox" Compressor Unit
Below, "Airdox" Cartridge

LETTERS
. . . to the Editor

Bumps at Springhill

In *Coal Age* of March (p. 107), reporting my paper on the bumps at Springhill No. 2, you credit me with saying that "shooting the pillars would eliminate bumps." That was not my meaning, the suggestion I advanced being that detonating shock charges in highly stressed pillars in advance of the longwall face would bring on a bump.

If this suggestion worked, it would not do away with bumps, but, as these bumps would be induced at the will of the operator, the hazard to life would be eliminated, as naturally these shock charges would be fired remote from the area affected.

I have read R. Dawson Hall's discussion on my paper, but feel that the beam action has more influence in bringing about conditions giving rise to bumps than the arching action which you suggest.

As far as we can ascertain, the sandstone bed, some 15 ft. above the coal and ranging from 0 to 70 ft. in thickness, is primarily responsible for the bumps, as in the extreme east section of the workings where there is no overlying sandstone, bumps do not occur.

T. L. McCall,
Chief Mining Engineer,
Dominion Steel & Coal Corporation.
Sydney, N. S., Canada.

Arching and Bumps

I note on page 107 of your March issue a report of the meeting of the Ground Movement and Subsidence Committee of the American Institute of Mining and Metallurgical Engineers in which is summarized R. Dawson Hall's discussion on the paper presented by T. L. McCall, chief mining engineer, Dominion Steel & Coal Corporation, presenting further notes on the phenomena of bumps in No. 2 mine, Springhill, N. S. I have also had an opportunity of reading Mr. Hall's written discussion in full.

As I understand his remarks, his theory of arching seems to be based on arches of ever-increasing span, and consequently ever-increasing load, on the abutments of the arch—which load can be resisted only by the solid coal at the forward haunch. I find it difficult to agree with Mr. Hall.

The sandstone, which is by far the strongest stratum, overlies the coal by only 15 to 20 ft. and is in itself after the order of 50 ft. in thickness at most. It would be natural to assume that resistance to subsidence is set up in this strongest stratum. Consequently, with even a comparatively short span, the rise of the arch would be very low.

Assume that an ideal (the semicircular) arch tries to form itself. This would be much stronger than an arch of such low rise/span ratio as would be that of any arch which formed itself in the sandstone. Assume also an ultimate crushing strength of 1,000 lb. per square inch for the coal and take 250 ft. as the distance over which underdraw has been observed. Then a span of 1,500 ft. would be the limit for even the ideal arch with a high rise/span ratio, for the coal could not then support the weight of the arch itself, irrespective of any loading superimposed on it.

To me it seems that the tendency to arch-forming is rendered abortive in the Springhill strata by the presence of the massive sandstone belt just overlying the coal. While forces are tending to form the arch, the material below the intrados (Mr. Hall's soffit) becomes loosened and its weight is taken by the sandstone, the strength of which is so great, even in beam action, that resistance is continued until the rise of the arch reaches a height of probably 100 to 150 ft. At some point the sandstone *beam* fails, the reaction on the solid coal beyond its fulcrum giving a sudden blow to the pillar, which has already become unduly stressed in the area of the underdraw, and this blow is the "jerk" referred to in Mr. McCall's paper as necessary to bring about a sudden readjustment of stresses which results in a bump.

While it is recalled that Mr. Hall postulates his discussion on the assumption of homogeneous strata, the above may perhaps explain why we believe that arch action is quite secondary at Springhill. Could an arch form there without the sudden failure of the sandstone beam, in all probability regularly recurring areas of highly weighted coal would be met, but unaccompanied by the bump phenomena—i.e., without the shock from the failure of the sandstone—the pillars probably would crush more or less continuously and even at point of failure of the arch at maximum span this crushing might not be accompanied by the suddenness and damage of the "bump," for failure would be not in the arch proper but in the shearing and crushing of the abutments—i.e., the solid coal at one end and the compressed gob at the other.

Sydney C. Mifflen,
Office Engineer,
Dominion Steel & Coal Corporation.
Sydney, N. S., Canada.

Calls Editorial "Unfair"

As a subscriber to Coal Age, and one who has always been interested in your publication and in the industry you attempt to serve, I wish to enter a vigorous criticism of your editorial "Facing the Music," in the April issue. I am greatly surprised that you would take such an unfair attitude toward the thousands of smaller manufacturers in the legitimate business of manufacturing renewal parts. Of course, after the statements you make, you cannot expect any support whatever from renewal parts manufacturers, and we confidently believe you will experience a very unsatisfactory reaction among the coal operators themselves because of the unfair attitude which you have taken. Our protest is entered in the spirit of constructive criticism.

National Armature & Electric Works
J. W. Overstreet,
Bluefield, W. Va. General Manager.

Industrial Notes

H. S. Colby, until recently president of the Air Preheater Corporation, has joined the staff of the Combustion Engineering Co., Inc., New York, as general sales manager. William Lloyd, for many years identified with the design, manufacture and sale of Coxe stokers, has rejoined the engineering department in much his former capacity.

I. W. Lewis, formerly president of the Riddell Stoker Co., is now in charge of Eastern Division sales of the Link-Belt Co.'s screw-type underfeed stokers, with headquarters at the Philadelphia (Pa.) plant.

Dorr-Oliver Corporation, New York, is now being dissolved after an affiliation of three years and the Dorr Co., Inc., New York, and the Oliver United Filters, Inc., San Francisco, Calif., will hereafter be operated independently.

Skf Industries, Inc., has removed its executive offices to the factory at Front St. and Erie Ave., Philadelphia, Pa.

Tippens & Sprengle, Inc., machinery dealers, have removed their Pittsburgh (Pa.) offices to the Koppers Building.

R. B. Mildon, until recently in charge of the stoker department, has been elected vice-president of the Westinghouse Electric & Mfg. Co. in charge of marketing, engineering, manufacturing and servicing at the Philadelphia (Pa.) works.

Coming Meetings

Illinois Mining Institute; annual boat trip and summer meeting on Str. "Cape Girardeau," leaving St. Louis, Mo., 8 p.m., June 8, and returning June 10.

Indiana Coal Producers' Association; annual meeting, June 12, Terre Haute, Ind.

Union Pacific Coal Co. Old Timers' Association: tenth annual meeting, Rock Springs, Wyo., June 15-16.

Colorado and New Mexico Coal Operators' Association; annual meeting, June 20, Boston Building, Denver, Colo.

National Retail Coal Merchants' Association; annual meeting, June 18-20, Willard Hotel, Washington, D. C.

American Society of Testing Materials; 37th annual meeting, June 25-29, Chalfonte-Haddon Hall, Atlantic City, N. J. Meeting of coal and coke section, June 27.

NOTES

. . . from Across the Sea

SOME TIME AGO, Sir William Ramsay, discoverer of the rare gases of the atmosphere—argon, neon, helium, krypton and xenon—suggested that coal be ignited in the mines, converted into gas and piped to the consumer. It was hailed as the idea of a wild enthusiast, but the Russians are ready to try any method that may promise success, and now the *Economic Review of the Soviet Union* reports that a mine specially planned for the underground gasification of coal has been constructed at Lisichansk, in the Donetz Basin.

On Feb. 16, the Soviet engineer, Kirichenko, who designed the mine, started the underground fire, and within 30 minutes the first samples of gas were taken for analysis. During the first five days after the fire was started, ten of a total of 400 dynamite shots, previously planted in the mine, exploded. The number of dynamite shots exploding was increasing day by day, indicating that the underground fire was growing in intensity. The gas-generating process was functioning normally, it is said, and early indications showed that the experiment was proving successful.

Interest in the experiment will be widespread. The danger with such a plan is that the fire may extend beyond the limits desired, but presumably the deposit chosen was cut off from other deposits so that they will not be involved, and was so located as to be near the point to be supplied with gas but so far from such points as not to cause a nuisance to property and the public. Moreover, it is likely to be difficult to control the entry of air so as to convert the coal to a uniform gas with the most favorable percentage of carbon monoxide and methane.

DE-ASHING of coal, declared Prof. A. Bone, of the Imperial College of Science and Technology, London, is one of the leading problems for technical research. The ash in coal for special purposes had, in Belgium, he stated, been reduced to 0.5 and 0.7 per cent. He advocated the thorough testing of the Pawlikowski internal-combustion pulverized-coal engine. Coal, he said, has become increasingly economical as fuel. When James Watt died, in 1819, 12 lb. of coal was used per indicated horsepower; now 1⅓ lb. sufficed for a kilowatt-hour, or 1 lb. for a horsepower. In 1819, it probably took 10 tons of coal to make a ton of wrought iron; now 2 tons suffices. Today, the thermal efficiency attained in the carbonization of coal at gas works probably is about 85 per cent.

These are important changes and mean reduced coal consumption, but, it may be added, if they had not come in the years past, where would coal's defenses against oil and natural gas have been? They and further economies are essential if coal is to continue in competition with rival fuels.

AT A MEETING of the Safety in Mines Research Board, in Sheffield, James Tonge described the hydraulic cartridge, which embodies several improvements and is now renamed the "hydraulic coal burster." As suspected when it was brought over to America, but not actually used in mines, it did not have, at first, the necessary travel in its pressure pistons to bring down the coal. That has been corrected by making the pistons in duplex, or telescopic, form, one part sliding on and fitting into the other. The machines are made of 2½-in., 3½-in. and 4-in. diameter, and machines are now available for drilling holes of these diameters without difficulty.

Mr. Tonge described the safety features. Even with permissible explosives, he said, a hundred special regulations, precautions or conditions hedged in operation, whereas the hydraulic coal burster could be handled by unqualified men, and no men had to be withdrawn from the face when the coal was being brought down. With a single hole, wider sections of coal can be safely forced down than when an explosive is used. Absence of fumes and better condition of the roof make it safer to approach a face that has been dislodged hydraulically than one that has been shattered by an explosive. The roof at the face is as safe after as before the coal is broken down. The coal is not pulverized, so it is more easily cleaned and is in better condition for the market.

FIVE HUNDRED diesel-oil locomotives have been sold by one company alone to coal mines in Germany, France and Belgium since 1927, according to Roderick Hedley, writing to the *Collivery Guardian*. He holds that there is an essential difference between the ordinary oil engine and a diesel-oil engine, because the ignition of the oil vapor in the latter is effected solely by the high temperature of the atmospheric air compressed in the engine cylinder. So backfiring is practically eliminated. Moreover, modern diesel mine locomotives are fitted with a special safety device which effectively extinguishes any flame that may enter the exhaust pipe. In storage and handling, no elaborate precautions are necessary, because the diesel-locomotive oils are much less flammable than the oils used in the ordinary oil engine.

The exhaust of a diesel engine has less than 0.1 per cent of carbon monoxide during the normal running of the engine, and even at idling speeds does not exceed 0.2 per cent. Though 0.045 per cent of carbon monoxide in the atmosphere is positively harmful, such percentages as those mentioned are said to be readily diluted by the air of the mine and reduced to such an extent as to be harmless.

To prevent flame from issuing from the exhaust, it is made to pass through a magazine, or scrubber, containing coarse gravel, and then issues into the atmosphere between two diaphragms made of 1.2x0.04-in. strips of rustproof metal spaced 0.02 in. apart.

Apparently, duralumin, silumin and other light alloys are being used more extensively in Germany and Central Europe than in America, judging by an article in *Schlägel und Eisen*, which states that they are being used for pneumatic drills, for coal cutters, cages, fans, haulage engines, safety lamps, respirators, oxygen tanks for rescue work, and stretchers. Recognizing how restricting weight is in mining machinery, it is strange that more use has not been made of the aluminum alloys. Silumin, for those of our readers who do not know it, contains 11 to 14 per cent of silicon, and the rest aluminum. It casts well with little shrinkage. With 13 per cent of aluminum the alloy weighs 0.095 lb. per cubic inch, whereas cast iron weighs 0.2604 lb. It is resistant to corrosion. American ferrosilicon alloys are Alpax and Alumac.

MACHINES for making vertical cuts in the coal face are being introduced into Germany and England. They are lighter machines than ours; some of them shear only and do not make horizontal cuts, though Anderson Boyes, in England, makes a "Universal machine" which cuts in any desired plane. In a recent article, the *Colliery Guardian* describes these machines. That made by Eickhoff Bros. runs around on caterpillars propelled by a 5-hp. reversible electric gear motor that enables it to travel up an inclination of 40 per cent. With heavier inclinations, up to 50 per cent, a small auxiliary hoist is used and special equipment will enable it to surmount even steeper slopes.

For shearing, it has a 9-hp. compressed-air motor which is guided in its back and forward motion by a frame with a toothed tube above and a channel guide below. At the front end, a compressed-air prop holds the saw at the right angle. The height of the frame that holds the saw is adjustable vertically by two supporting levers, through a right- and left-threaded spindle, and the direction of the saw can be adjusted by rotating the frame on the caterpillar. The saw has 35

cutter picks and is driven at a speed of 400 ft. per minute.

Two types of Korfmann shearing machines are made, one for narrow work and one for deep cutting in wide work, both being adapted for cutting in any plane by turning the saw through the desired angle on its crosshead. The machine travels either on a small wheeled truck or on skids. The saw is driven by a 15-hp. compressed-air motor or by a 10-hp. polyphase 220-volt electric motor. On the skid or truck is mounted a turntable on which rest two vertical steel posts with a crosshead which carries the frame that holds the saw. The two pillars are connected to a screw head that engages the roof. A worm gear on the crosshead between the pillars pushes or pulls a crosshead on the saw frame. A cut can be made between 6 and 6½ ft. deep. The cutting chain carries 45 tungsten-carbide (Widia) tipped bits held in position by setscrews and runs at 500 ft. per minute.

Another saw, made by Flottmann, which, by the way, has been used in the anthracite region of this country and has given good satisfaction, is operated by a 2½-hp. compressed-air motor and is held up to its work by hand. The blades of the eight-cell rotary engine are made of a compressed resinous material of light weight and suitable for high speeds. The exhaust of the motor is carried off by a short length of hose. The cutting chain has 37 single cutter picks connected by swiveling links. Its kerf is about 1 in. wide, and the picks, being tipped with hard metal, have exceptional wear-resisting and cutting properties, but the saw should not be used to cut through pyrite, because the resistance will set up shock stresses.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Mine Examination and Valuation, by C. H. Baxter and R. D. Parks, professor and associate professor of mining engineering economics, respectively, Michigan College of Mining and Technology, Houghton, Mich. 316 pp., 5x7½ in. Price, $3.

This book deals mainly with metal-mine examinations, but its pages on valuation, which are many, describe the principles of valuation and afford many tables relating thereto. These are followed by a description of the Michigan mine-appraisal system by F. G. Pardee, mining engineer and appraiser of mines for the Michigan Geological Survey.

—⟡—

Pneumatic Tabling of Coal—Effects of Specific Gravity, Size and Shape, by H. F. Yancey and C. B. Porter, U. S. Bureau of Mines, Technical Paper 536. Price, 5c.

Like the wet coal-washing table, declares the monograph, the pneumatic table is a sizing as well as a cleaning device. The two operate in directly opposite ways in relation to size of particle. On a wet table, particles of a given specific gravity become successively finer with increasing travel. On a dry table, the particles become increasingly large as the refuse end of the table is approached, and this coarse coal is accompanied by finer impurities. Obviously, then, say the authors, the mechanism of the separation on the pneumatic table with regard to size is such that it can make a more efficient separation with a feed in which the impurities are coarser in average size than the coal than it can if the coal is coarser than the impurities. With the wet table, the most efficient separation can be made if the impurities are finer than the coal.

Likewise the pneumatic table concentrates flaky material in the zones near the head-motion end and cubical particles in the opposite end. Inasmuch as flaky raw coal increases with increase in the specific gravity of the components, declare the authors, this natural condition aids the wet table and hinders the pneumatic table in effecting a separation between coal and the impurities ordinarily associated with it.

—⟡—

The Pressures Produced by the Striking of Momentary Arcs in Closed Vessels, by T. S. E. Thomas. (British) Safety in Mines Research Board; Paper No. 77. British Library of Information, New York City. 16 pp. Price, 17c.

When an arc is generated inside the flameproof casing of a machine by any cause, such as a transient overvoltage, part of the energy liberated will be expended in increasing the pressure within the inclosure. The possibility that the casing may be ruptured by this rise in pressure has caused the studies described in this monograph to be made. It has been thought that something resembling a hammer blow might be generated at the moment of striking the arc.

It was found that, with 750-volt, 210-amp. a.c. current, a maximum arcing energy of 2.54 kw.-sec. and a maximum pressure of 4.7 lb. per square inch was generated when copper electrodes were used. With the same current, the maximum arcing energy was 1.71 kw.-sec., with a maximum pressure of 1.85 lb. per square inch, when aluminum electrodes were used. With a heavier current, the pressures were higher. Using copper electrodes and 720-volt, 1,700-amp. a.c. current, the highest arcing energy measured was 34 kw.-sec., the pressure generated being 62 lb. per square inch, though where the arc burned itself out, the pressure generated was 85 lb. per square inch. With aluminum electrodes, the arcing energy was 32.6 kw.-sec. and the pressure 72.5 lb. per square inch. With 2,000-volt, 190-amp. a.c. current, using copper electrodes, the pressure was 6.3 lb. per square inch.

Within the limits of power of the arc employed, concludes Mr. Thomas, no "pressure pulse" of high magnitude was produced. Pressure within a closed vessel is proportional to arcing energy and is greater when electrodes are of aluminum than when they are of copper.

Difference in pressure produced by copper and aluminum can be explained by the greater heat of formation of aluminum oxide. The mass of air in the arcing chamber was 8.85 grams. If all the heat were communicated to "the gas" in the chamber, the pressure rise would be 149 lb. per square inch with copper and 510 lb. per square inch with aluminum, but the greater part of the heat energy remains in the solid oxide formed; the electrodes absorb some of it, and some of the oxygen forms nitrogen oxides by endothermic reactions, which reduce pressure by taking heat from the gas. The chamber contained no methane.

—⟡—

Stop That Smoke, by Henry Obermeyer. Harper & Bros., New York City. 289 pp., 5¾x8¾ in. Price, $2.50.

Despite some technical errors and a disposition to emphasize the faults of soft coal, and soft-pedal those of oil, this book is well worthy of perusal and brings together much information about the war being waged against smoke, and the reason for it. Some of the worst offenders against cleanliness in cities are the burners of oil. It is true oil can be burned with little offense, but it is easy to get the mixer out of adjustment, and then the smoke volume is large. Such smoke is unusually greasy and objectionable.

Apparently the author is opposed only to smoke and sulphur compounds. He gives carbon monoxide and fly-ash little, if any, attention. One cannot feel that the judgment of the writer is based on a knowledge of the entire question in assessing blame among the persons who pollute the atmosphere.—R. Dawson Hall.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Series of Small Lamps Show Trip Positions on Slope

When the controls of a hoist are to be located some distance away from the equipment, there arises the problem of arranging an indicator at the control station. Mechanical transmission by chain, belt or shafting from rope drum to indicator is practicable only over a limited distance and under favorable conditions. Beyond those limits an electrical method of transmission usually is preferable.

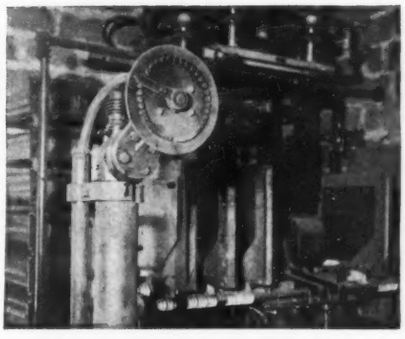
An example of a simple and inexpensive electrical method is in operation at Brock No. 4 mine of the Continental Coal Co., Cassville, W. Va. This has been in use several years without giving any trouble and during that time no faults have appeared in the system of indication employed.

The hoist handles two 4-car trips in balance on a slope extending from the mine bottom to the top of the tipple, where two rotary dumps are set on an angle in line with the mine slope. Hoisting equipment is located near the slope portal and the operative's station is up on the slope trestle between the tracks and close to the lower ends of the rotary dumps. The operative has his back to the hoist house and faces the dumping equipment. Distance from the hoist to control station is approximately 90 ft.

Standard equipment on the hoist included the usual dial-type indicator geared so that the pointer would advance somewhat less than one revolution during a hoist and return during the next hoist. The electrical indicator system was developed at the mine and the parts assembled or built in the mine shop. The dial pointer was replaced by a hand equipped with wiping contact spring, and the dial itself was replaced with a disk of insulating material equipped with 24 contact buttons and two contact segments.

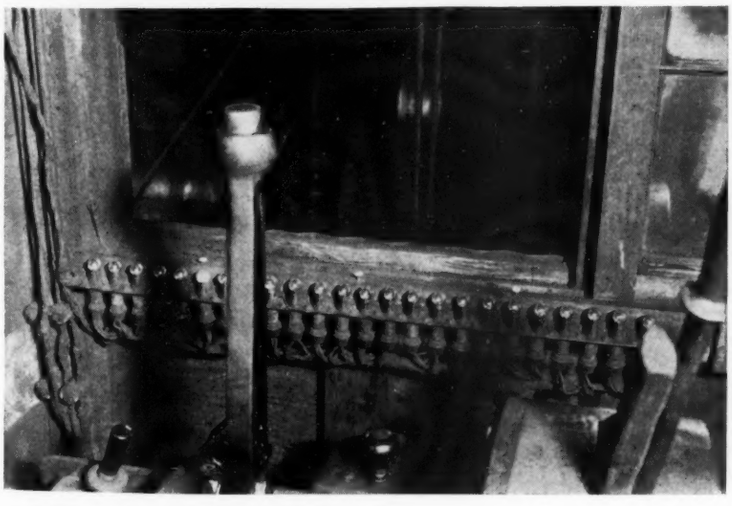
Each contact button is connected to a 6-volt, 3-candlepower lamp located in the control booth at the dump. The lamps, 24 in number, are mounted in a straight line on the sill of the window through which the operative looks when spotting a trip in the dump. During a hoist the lamps light and go out consecutively from left to right or from right to left, depending on which track the loads are coming up on. The operative therefore has before him a visual indication of the progress of a trip or of its position if it is stopped. By white tacks located beside certain lamps he is informed of the proper time to begin slowing for the stop.

Lamps are of the standard type used in automobile tail lights and the power supply is low-voltage a.c. from a toy transformer. Because the lamps are operated below rated voltage their life is much longer than normal. John Oberley, chief electrician, and H. J. Dewitt, mine electrician, both of whom were concerned with the design and installation of the indicator, look with satisfaction on the reliable and trouble-free service that it has given.



Contact Dial Which Replaced Indicator Dial on Hoist.

The Lamp to the Left of the Controller Handle Is the Only One Lighted, and Back of It Is a White Tack. This Indicates That the Hoist Is Stopped With the Left-Hand Trip at About the Slowing-Down Point.



Hoisting Kinks

At the New Monarch mine of the Consolidated Coal Co. of St. Louis, Herrin, Ill., the job of the hoisting engineer has been made pleasanter by a flow of cool air from the mine exhaust. A 6-in. blower fan of the forge type takes air from the pump compartment of the shaft through a 6-in. pipe. The air is de-

livered in front of the engineer's station and, although the temperature adjacent to the hoisting engine is 140 deg. F., the atmosphere surrounding the engineer is comfortable in the hottest weather. Controls enable the engineer to adjust the volume and, therefore, conditions at his station.

In at least one metal mine, the Porcupine-McIntyre, Timmins, Ontario, the engineer is placed in a soundproof box which shuts out distracting conversations in the engine room and affords a view of nothing but the hoist and controls, thus enabling him to give his full attention to operation of the equipment and signals from the men below.

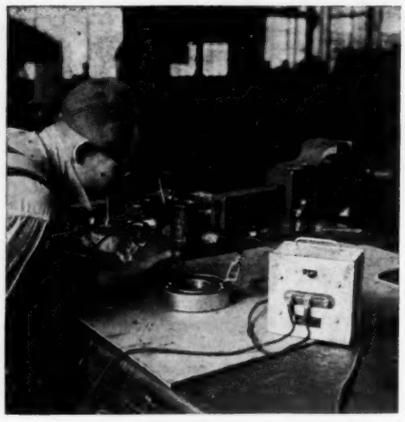
Electrical Etcher Used for Dating Ball Bearings

Devising a simple means of obtaining an adequate check on the service life of ball or roller bearings is one of the problems of the maintenance department. On equipment such as locomotive armatures, where the armatures, complete with bearings assembled, may be removed from one locomotive and, after certain repairs, installed in another locomotive, purely clerical methods of keeping track of specific bearings are complicated and are susceptible to errors. The simpler way is to date the new bearing when it is installed. On certain bearings, especially the roller type with bronze retainers or cages, it is practicable to stamp the date on the retainer, using steel stencils. But on most types of ball bearings this method is impractical, because of the design of the retainer. The bearing races are, of course, too hard to be marked by any simple mechanical means.

Marking the races with an electrical etching pen is the method now employed by a number of coal companies. The accompanying illustration shows a mechanic in the Mt. Hope (W. Va.) shop of the New River Co. dating a ball bearing by use of the high-current type of electrical etcher. The pen point consists of a short piece of No. 6 B & S copper sharpened to a point. The mark results from discoloration due to local heating as the high current at low voltage passes from the small contact point to the metal being marked. The low-voltage supply is obtained through a special transformer powered from the 110-volt a.c. line.

Another type of etching pen is available which operates from 6-volt a.c. or d.c. sources and depends on a slight arc at the pen point for the mark. This type operates on but a fraction of the current required by the other type. The pen holder or handle contains an electro-magnet which causes an armature to vibrate rapidly up and down. The pen point is attached to this armature. The circuit, therefore, is rapidly made and broken, thus causing a series of small arcs between pen point and the work. These arcs discolor and pit the metal. If the pen is moved rapidly the mark is a line of dots, but if moved slowly the line will appear as a continuous mark or scratch.

The type of etcher pictured and first described is considered the more practical for heavy work because the point is easier to manipulate, since it can be moved faster and need not be sharpened as often as the point of the vibrating pen. The vibrating etcher has an advantage, however, in marking very thin steel or delicate parts, in that there is less danger of overheating the part.



Dating a Bearing to Be Installed on a Locomotive Armature.

Pumping Hints

Measuring and recording the original pressure generated by a centrifugal pump offers a simple basis for checking progressive wear or corrosion, E. E. Kendall, engineer, Deming Pump Co., points out in a paper presented at a recent meeting of the New River and Winding Gulf Mechanical and Electrical Institute. When the pump is installed and still is in new condition, the pressure should be observed while the unit is running at normal speed with the discharge valve closed and the case free of air.

A simple and effective method of recording this highest, or shut-off, pressure is to remove the face of the gage and mark the dial. Later, the condition of the pump can be checked by closing the discharge valve and observing how the generated pressure compares with that originally recorded, the speed being the same. "The gage should always be located between the pump and the check valve or shut-off valve and there should be a shut-off valve in the small line between the discharge line and the pressure gage, and this valve should be closed at all times except when it is desired to take a gage reading." This protects the gage from damage from high pressures that may come on the line, particularly when the pump is shut down. Another use for a gage is at starting to indicate when the pump is entirely free from air and it is time to open the discharge valve. A pressure lower than normal indicates that some air remains in the pump.

Stuffing boxes on reciprocating pumps should be allowed to leak slightly at all times, said Mr. Kendall. This may be contrary to the accepted idea that as a stuffing box is designed to prevent leakage, therefore the gland should be tightened up until none appears. If this is done, however, the packing will wear rapidly and possibly score the rod or plunger. Once the damage is done, packing is worn still more rapidly and excessive leakage persists. It therefore is highly important that this precaution be observed with a new pump or a pump newly equipped with plungers or rods.

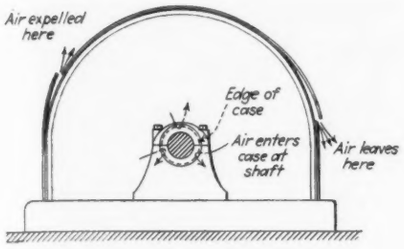
A simple and inexpensive method of preventing future trouble and expense advocated by Mr. Kendall is the application of cup grease to all exposed threads on studs and bolts when a mine pump is installed. Corrosion will be prevented, and when it is necessary at some future time to dismantle a part there may be a consderable saving of labor and perhaps a saving in parts. Acid water and other adverse conditions emphasize the necessity for greasing, but no mine drainage condition is so ideal as to make greasing a wasted effort.

What About It?

New conditions bring about new operating problems. This has been true of coal mining for years and applies particularly at bituminous mines at the present time under the new restrictions as to hours of work, plus higher wage scales. Shorter working time and increased wages bring the practical operating man face to face with the twin problems of getting out the tonnage and keeping down costs. It is not too early, therefore, to ask what steps are being taken to meet these new conditions. Have you met with a new problem for which a ready solution is not available? Possibly something in these pages will supply the answer. Have you developed a new operating, electrical, mechanical or safety short-cut to fit the new requirements? If so, it should be in this section. Send it in. A sketch or photograph may help to make it clearer, and acceptable ideas will be paid for at the rate of $5 or more each.

Opening Flywheel Case Cools Bearing

At the Kathleen mine of the Union Colliery Co., Dowell, Ill., a 500-kw. motor-generator set furnishes d.c. power for the hoist motor. There are four bearings on the shaft of the set and the two center bearings always have tended to heat slightly, due to the lack of adequate air circulation. Between the two center bearings is a 10-ton flywheel, and the case of this flywheel also heated be-



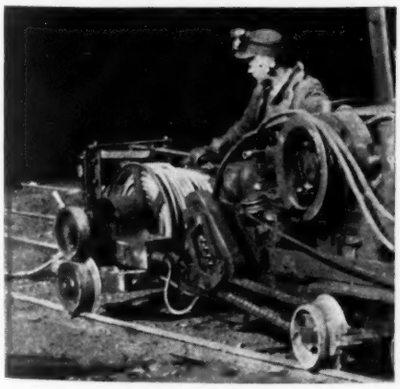
Vents Provide Air Circulation.

cause of air friction between the wheel and the casing.

C. E. Cawvey, electrical engineer, details the method employed to reduce the heating effect, which consisted primarily of unbolting the case at two points to allow the air being circulated by the flywheel to escape to the outside. The flywheel now acts as a big blower and instead of churning the air around inside the case expels it through the two vent holes in the casing. A great quantity of air at a substantial pressure escapes in this fashion, which not only agitates the atmosphere surrounding the set but also results in an inflow of air into the casing around the shaft, thus effectively cooling the bearings. The flywheel case also is cooled by the incoming air, thus removing a large source of heat radiation near the bearings. The real value of this method will be determined finally with the onset of hot weather, Mr. Cawvey remarks, but it is felt that the circulation attained will meet the situation effectively.

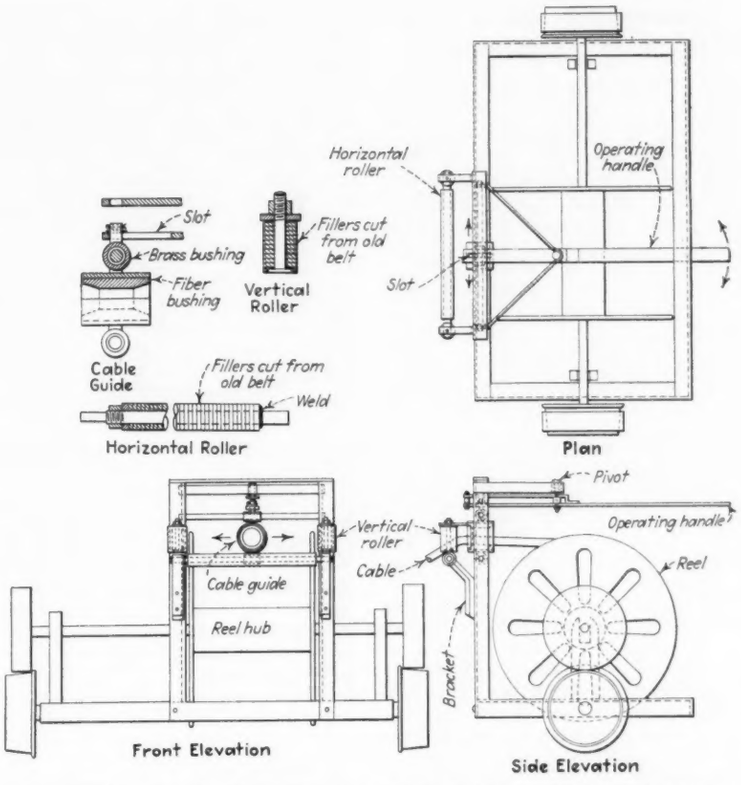
Hand-Operated Cable Guide For Mining Machine

To facilitate reeling up a mining-machine cable when coming out of a place, D. G. Winchester, shop foreman, Pruden Coal & Coke Co., Pruden, Tenn., has developed the hand-operated cable guide



View of the Cable Guide From the Machine Runner's Position.

shown in the accompanying illustrations. The guide elements proper are mounted in an angle-bar frame riveted to the back end of the reel truck, and consist of the guide itself, which is supported on two



Construction Details, Hand-Operated Cable Guide for Mining Machines.

round steel guides by brass bushings, an operating handle, two vertical rollers and a horizontal roller. The operating handle is pivoted as shown, with the slotted end over the post on the cable-guide assembly. The slot is necessary to allow the guide to travel from one end of the round steel guides to the other, thus guiding the cable onto the reel in an orderly manner.

The cable is supported horizontally at the point where it enters the guide by a roller mounted in brackets attached to the angle-bar uprights. This roller is made up by threading fillers cut from an old leather belt onto a steel shaft. Two vertical rollers also are used to keep the cable from coming in contact with the frame at either side. These are suspended from strap-steel brackets as shown, and, like the horizontal roller, are made from leather fillers threaded onto a bolt, steel washers retaining the fillers in place.

With this type of guide, which has been giving satisfactory results since the first of the year, the machine man can operate both the controller and the guide from his seat on the truck. Fussing with the cable while coming out of a place is eliminated, thus reducing danger of injury, and cable life is lengthened, due to proper reeling.

Both Cable Guide and Controller Are in Easy Reach of the Machine Man.

New Maintenance Practice Cuts Ball-Bearing Renewals

Several years ago the Island Creek Coal Co., operating in Logan County, West Virginia, tried a method of ball-bearing maintenance not generally recommended, but results proved its advantage and it has been continued without change. Bearings of all equipment which comes to the main shop for repairs are washed and carefully inspected for cracked or chipped balls. In case the slightest defect is detected on a ball in a bearing otherwise in good condition, the damaged ball is replaced instead of scrapping the entire bearing or possibly instead of taking a chance and allowing a slightly defective ball to go back into service.

Balls from used bearings are utilized for making the replacements, and therein lies the debated feature. Some engineers declare that the replacement balls will vary too widely in size from those in the bearing and therefore will cause early failure. At Island Creek, the replacement balls must be from the same type and size of bearing and from one which shows little or no sign of wear.

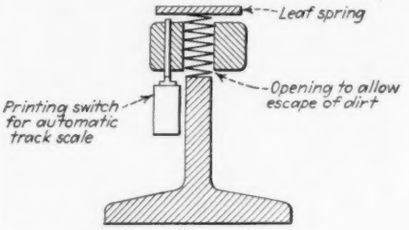
When the practice was first put into effect the company was replacing a ball bearing with a new one for approximately each 30,000 tons of coal mined. Each year the performance has been bettered, and in 1933 there were mined 119,000 tons of coal per new ball bearing installed. This applies to direct-current equipment only, but includes even the reel motor bearings. An approximate count indicates that there are between 400 and 500 ball bearings in use on equipment. During the year 1933 only 31 new bearings were installed.

Leaf Springs on Top of Rail Operate Scale Switches

Not long after an automatic scale was installed in the headhouse at the Junior mine of the Norfolk & Western Ry. fuel department, Chattaroy, W. Va., operating difficulties were encountered with the printing switches, which are fastened to the rail. The trouble was not in the switch proper but in the method by which the ball of the rail was intended to spring down and push the switch. A longitudinal cut had been made through the rail flange at each printing switch, and the ball of the rail soon took a permanent set, thus closing the gap in the web instead of springing down each time with the weight of the car wheel.

The halftone and sketch show a new method developed at the mine and which has been operating several months with entire success. A new length of rail without cuts in the web was installed. For a distance of 14 in. at each printing-switch position the top of the rail was cut away to a depth equaling the thickness of a heavy spring leaf such as is used on a motor truck. Each such spring leaf was riveted to the rail at the end farthest from the corresponding printing switch.

Showing Leaf-Spring Inserts in Top of Rail Above Printing Switches.



Rail Section Showing Coil Spring.

The spring leaves were designed with a curvature sufficient to allow the top surfaces of the free ends to stand about $\frac{1}{16}$ in. above the top of the rail. Resumption of this normal position after depression by a car wheel is aided by a stiff coil spring set in a hole drilled vertically down through the center of the ball of the rail. The hole is 1 in. in diameter and extends $\frac{1}{2}$ in. down into the web of the rail, thus providing an opening on each side for the escape of accumulated dirt.

The only attention required with this new type of rail tread depressor is infrequent cleaning of the accumulation of coal dust from the crack between the leaf spring and rail. This is best done with a hack-saw blade.

Arc-weld Axle Straightening Has Endured Time Test

Only time applies the acid test to new methods. After the long-term test of months or years the method is dropped, or becomes permanent in the sense that it endures until changed equipment or conditions render it obsolete. Recently an inquiry was made to learn what the time test had decreed to be the fate of the method of straightening axles and shafts by arc-welding developed in the main shop of the New River Co., Mt. Hope, W. Va. (described in the Operating Ideas section of *Coal Age*, November, 1928).

The method has endured in the New River shop because it is sure, simple and economical, and has shown no bad effects such as inducing subsequent breakage. Straightening by arc-welding has not, however, been widely adopted by other companies, perhaps because of the apparently unreasonable, or at least unusual, procedure on which the process is based.

Briefly the method consists of running a bead of metal lengthwise along the axle on the concave side of the bend, thus apparently causing that side to shrink sufficiently to bring the axle back to normal. A relatively high amperage is used: on a $3\frac{1}{2}$- to 4-in. axle, for example, a $\frac{3}{4}$-in. electrode is selected and the current adjusted to 350 amp. Advantages are that an experienced operator can judge rather accurately the amount and length of weld required and that the job can be done with a minimum dismantling of parts on the shaft.

At the time *Coal Age* described and pictured the practice it had been in use three years. Now it has undergone nine years of "regular practice" test and is held in the original high regard as a time- and money-saving kink.

Fitting Indicates Bearing Is Full of Grease

There is room for improvement in a design which includes no method of indicating that a bearing has been completely filled with grease from a pressure gun and that when further pressure is applied to the greasing connection the grease is being forced out into the motor case. This condition often is the cause of damage to the motor insulation or commutator. In a paper read at a meeting of the New River and Winding Gulf Electrical and Mechanical Institute, C. O. Gallaher, chief electrician, Elkhorn Piney Coal Mining Co., Stanaford, W. Va., suggested that the commutator-end ball bearings on locomotive motors be fitted with inverted grease valves to allow grease to overflow when a certain pressure is applied.

Grease Oozing Out of Fitting at Center of Bearing Cap.

The accompanying illustrations show the details of an armature bearing thus fitted. The button-head pressure-gun filler fitting at the top of the bearing cap was not disturbed and is used as before when adding grease to the bearing. The new overflow fitting is screwed into a hole in

Showing Details of Fitting.

the center of the cap. One picture shows a string of grease coming out of this fitting, indicating that the space has been pumped full.

The other picture shows the details of the new fitting, which has been removed and laid on a block of wood near the bearing cap. It is made up of a commercial Type A-425 straight Alemite fitting about 1 in. long, and a ¼-in. Alemite Type A button-head filler fitting. The valve and spring are removed from the button-head fitting and it is threaded on the inside to accommodate the commercial fitting. The pins of the latter fitting are filed off so that it can be screwed into the other. When assembled the commercial fitting extends into the grease space and the combination allows an overflow of grease upon application of sufficient pressure to open the valve of the commercial fitting. Entrance of dirt from the outside is prevented.

The valve should, of course, open at a light pressure, so that the grease will come out through the fitting before being forced through the seal around the shaft.

Catenary Suspension for Trolley Wires

For a good many years, a recent issue of *O-B Haulage Ways* observes, catenary overhead suspension has been used extensively on electric railway systems, but only recently has there been a noticeable trend toward this type of suspension at mines. Mine operators have long appreciated the fact that with rigid suspension there is considerable collector hammering, which tends to crystallize the wire and cause arcing and burning of both collector and wire. Yet, difficulties such as limited headroom and two-wire suspension on curves proved to be serious obstacles to the development of mine catenary construction.

With the modern equipment available, however, these objections have been eliminated and many operators are taking advantage of flexible construction as a means of adding years of life to trolley wire and reducing collector replacements. While there are a number of accepted methods of installing mine catenary systems, one at least is extremely simple and involves the use of only three additional items besides those usually employed in rigid suspension: catenary clamps, dual clamps and spring-steel straps.

Fig. 1 shows a suggested method of installing simple tangent catenary which uses all of the original equipment. The old trolley wire serves as both messenger wire and feeder, the old clamps

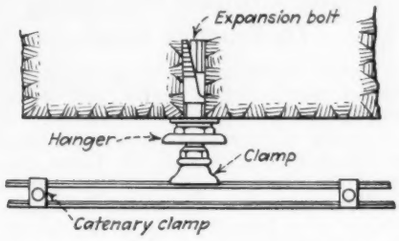


Fig. 1—Tangent Catenary Using Old Trolley Wire as Both Feeder and Messenger

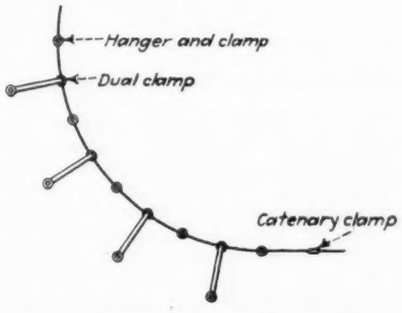


Fig. 2—Effective Curve Construction.

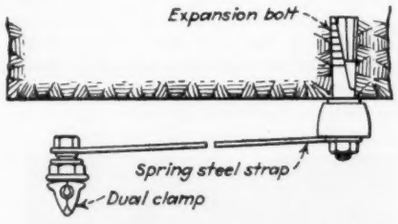


Fig. 3—Curve Suspension Employing Spring-Steel Strap and Dual Clamp.

and hangers being used to anchor this messenger. From the old trolley wire, new wire is suspended by catenary clamps about 4½ ft. apart. Considering the speeds at which locomotives travel, this type of construction provides ample flexibility to eliminate any hard spots usually found in rigid suspension. The additional headroom is equal only to the height of the catenary clamp—1½ in.

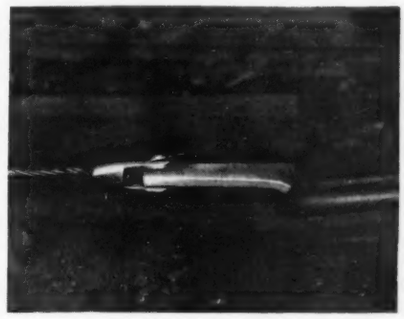
Recommended practice on curves is shown in Fig. 2. The curve is established with regular trolley clamps holding the messenger securely to the roof. Then at proper intervals dual clamps, which hold both the messenger and trolley wires, are suspended from the roof on spring-steel straps, as in Fig. 3. This strap braces the trolley wire, keeps it from turning, and provides the necessary flexibility. One of the important advantages of this method of curve construction is the elimination of guy wires, which require much more room and constitute dangerous obstructions. The strap does not extend below the trolley wire and does not require any more headroom than the tangent catenary described above.

Because old trolley wire can be used as both feeder and messenger, a number of properties have found it quite economical to change over to catenary construction when it became necessary to renew the old wire. Old wire used in this way is much more valuable than it would be as scrap, and the catenary system, in addition, is a source of economy for years to come. The method outlined may vary slightly with individual conditions, but basically has proved to be very effective, it is pointed out.

Non-Catching Hook Is Used On Trip Retarder Rope

If the attachment hook used on the end of a wire rope is to be dragged along the track it is necessary that it be designed so that it will not catch on ties or other parts of the track. A type of "hook" used at Junior mine, Howard Collieries, Norfolk & Western Ry. fuel department, Chattaroy, W. Va., is shown in the accompanying illustration.

The rope is used on a retarder controlling the gravity feeding of trips of loaded mine cars to the dump at the headhouse. The retarder is located close to the dump controls and is equipped with a motor to rewind the wire rope on the drum, thus dragging the hook back up the track to be connected to the rear end of the next loaded trip.



"Hook" in Working Position in the Link.

The "hook" consists of a heavy steel bar about 13 in. long, with a hole in one end and with the other end bent downward. Notches cut in each side of the bent section narrow the bar sufficiently to allow it to assume the position pictured in relation to the mine-car link. To remove the "hook" it is necessary to have enough slack in the rope so that the bar can be turned part way around, thus allowing it to be pulled out of the link opening edgewise.

WORD from the FIELD

Mechanically Loaded Tonnage Increases in 1933

Production of coal by "mechanized mining" underground rose to 37,820,000 tons in 1933, an increase of 2,003,000 tons, or 5.7 per cent, over the 1932 total of 35,817,000 tons, according to preliminary compilations by the U. S. Bureau of Mines. This compares with an increase of 5.9 per cent in bituminous output. The 1933 mechanized tonnage was 11.5 per cent of the United States total, against 11.6 per cent in 1932.

Mechanized mining, according to the Bureau, has passed the experimental stage in twenty States. Changes from 1932 to 1933 in the principal States are given in the accompanying table:

Increase or Decrease in Mechanically Mined Tonnage, by States

(In Thousands of Tons)

	1933	1932	Increase or Decrease, Per Cent
Illinois	17,122	15,360	+11.5
Indiana	4,222	3,225	+30.9
Pennsylvania	6,682	7,414	— 9.9
Ohio	1,029	850	+21.1
Wyoming	2,970	2,698	+10.1
Utah	551	754	—26.9
Montana	1,087	1,074	+ 1.2
Kentucky	790	1,093	—27.7
Virginia and West Virginia	1,165	1,172	— 0.6
Alabama	1,389	1,237	+12.3
Other states*	813	940	—13.5
Total	37,820	35,817	+ 5.6

*Washington, Arkansas, Maryland, Missouri, Colorado, Tennessee, New Mexico, Michigan and Iowa, in order.

In comparison with 1932, the number of mechanical loaders in use—mobile loaders, scrapers and duckbills—decreased from 835 to 748; pit-car loaders, from 3,112 to 2,453. The number of mines using hand-loaded conveyors dropped from 136 to 114. Of the 1933 tonnage handled by machines, mobile loaders accounted for 47.2 per cent; scrapers, 2.6 per cent; and pit-car loaders and conveyors, including duckbills, 50.2 per cent.

Comparative outputs of the various types of machines in 1932 and 1933 were as follows:

	1933, Tons	1932, Tons
Mobile loaders	17,865,000	14,825,000
Scraper loaders	950,000	1,132,000
Duckbills and other self-loading conveyors	1,656,000	1,630,000
Total	20,511,000	17,587,000
Pit-car loaders	11,413,000	12,590,000
Other hand-loaded conveyors	5,896,000	5,640,000
Grand total	37,820,000	35,817,000

Alston Buys Shovel

Alston Coal Co., Pittsburg, Kan., it is reported, has purchased a new stripping shovel with a 15-cu.yd. dipper and a 100-ft. boom from the Marion Steam Shovel Co.

Southern Illinois Organizing To Promote Coal

A new organization to promote the sale of coal mined in central and southern Illinois was tentatively launched at a meeting of representatives of 26 cities in the area, held at East St. Louis, Ill., April 26. A committee was named to consider plans for a permanent organization, to be known either as the Southern Illinois Chamber of Commerce or the Southern Illinois Industrial-Civic Association, and a number of meetings were held in various towns in May with the object of drumming up support.

Battle Made NCA Secretary

John D. Battle, who joined the National Coal Association organization fourteen years ago and occupied the post of traffic manager for twelve years, was named to the post of executive secretary on May 4, succeeding C. B. Huntress, now president of Appalachian Coals, Inc. Prior to joining the association, Mr. Battle was connected with Southeastern railroads for over fourteen years and served with the U. S. Railroad Administration during the World War.

F. F. Estes, who joined the association fifteen years ago and has occupied the posts of assistant to and assistant traffic manager for much of the time, succeeds Mr. Battle as traffic manager.

Harris & Ewing

John D. Battle
New Executive Secretary, National Coal Association

Mineral Planning Committee Named by President

Appointment of a Planning Committee for Mineral Policy was announced by President Roosevelt late in April. The first job to be undertaken by the committee will be a forecast of probable demand for mineral products during the next twelve months. With that forecast out of the way, the committee is to study such fundamental problems as the future consumption of important minerals, curtailment of production, relationships of federal and State control, and the coordination of emergency appropriations which have a bearing on the mining industry.

Under the codes, much reorganization of the mineral industries is anticipated. The President is greatly interested in conservation and in preventing ruinous expansion. Reopening of thousands of small wagon mines since the bituminous code went into effect is cited as one example of what can happen without careful planning in an industry already burdened with excess capacity and the dislocations and human suffering which go with such conditions. These, it is said, are conditions which the national administration is trying to correct.

The membership of the committee as originally announced was: Harold L. Ickes, Secretary of the Interior, chairman; Dr. C. K. Leith, University of Wisconsin; J. W. Furness, chief of the minerals division, Bureau of Foreign and Domestic Commerce; Wayne C. Taylor, Washington; F. A. Silcox, chief, Forest Service; Herbert Feis, economic adviser, Department of State; Walter C. Mendenhall, director, U. S. Geological Survey; Lieut.-Col. E. R. Harris, U. S. Army; Scott Turner, director, U. S. Bureau of Mines; Willard R. Thorp, Washington, and Leon Henderson, director of planning and research, NRA.

Continue War on Substitutes

Bituminous operators and miners vigorously continued the campaign against the use of government funds for the construction of facilities for the use of substitute fuels in April and May. As a result of the efforts of local operators' groups, equipment manufacturers, railroads and the National Coal Association, the new Alexandria (Va.) high school, being built with PWA money, will be equipped with stokers for bituminous coal. The Veterans' Administration stated that coal would be continued at the Knoxville (Iowa) Veterans' Administration Facility.

The National Coal Association and the United Mine Workers renewed protests against the Loup River hydroelectric project in May, but Secretary of the Interior Ickes refused to reopen

the case. The association and the union also filed briefs in opposition to a loan for a diesel-powered light and power plant at Carbondale, Ill., originally turned down by the PWA but later reopened. On May 20, the National Coal Association renewed its protest against the use of public funds for further expansion of the TVA power program.

Decision of the Department of Justice to use gas at the federal penitentiary at Atlanta, Ga., due to a rise in the price of coal, brought forth a joint protest from the association, the United Mine Workers and Alabama operators. Other developments in the competitive fuel situation in May included the allotment of PWA money to build butane-gas plants and distribution systems in the following communities in Illinois: Bushnell, $80,000; Rushville, $72,000; Sullivan, $79,500, on the ground that "this type of plant is particularly adapted to use by small communities where the operation of a plant to manufacture gas from coal would not be justified."

—❖—

New Preparation Facilities

New contracts and construction of preparation-plant facilities at various coal operations were reported as follows in May:

GULF SMOKELESS COAL CO., Wyco, W. Va.; contract closed with the McNally-Pittsburg Mfg. Corporation for a washing plant consisting of two Norton washers to handle 7x⅜-in. coal at the rate of 135 tons per hour and classify it into four sizes, together with a Norton "vertical-pick" breaker for reducing the raw feed to 7 in. Minus ⅜-in. coal will be bypassed around the washers.

HANNA COAL CO., Piney Fork No. 1 mine, Piney Fork, Ohio: contract closed with the Link-Belt Co. for tipple and washery with an over-all capacity of 350 tons per hour. Coal under 4-in. will be cleaned in two Link-Belt-Simon-Carves washers with an aggregate capacity of 240 tons per hour.

HOCKING VALLEY MINING CO., Eclipse mine, The Plains, Ohio: reconstruction of present tipple into five-track, five-product plant now under way. New equipment, furnished by the Robins Conveying Belt Co., includes a 36-in., 215-ft. belt conveyor with a capacity of 250 tons per hour, two 4x10-ft. "Gyrex" vibrating screens, shaking chute and two loading booms to make possible shipment of the following sizes: 4-in. lump, 4x2-in. egg; 2x1½- and 1½x¾-in. pea and ¾-in. slack.

HUNTSVILLE-SINCLAIR COAL CO., Huntsville, Mo.; contract closed with the McNally-Pittsburg Mfg. Corporation for Norton washing plant for 1¼x0-in. coal; capacity, 150 tons per hour.

NATIONAL FUEL CO., Puritan mine, Frederick, Colo.: construction of a new steel tipple to replace wooden structure recently destroyed by fire now under way. The screening plant is arranged with main screens for the larger sizes, auxiliary screens for the stoker sizes and crushing facilities for all sizes over 2-in. Shaking picking tables are included for lump, together with special retarding conveyors for loading box cars. The plant is designed for dismantling and removal to another location as soon as the mine is worked out. Allen & Garcia Co. are the engineers. Capacity is 500 tons per hour.

Coal Operators Debate Proration Program At Chamber of Commerce Meeting

SHOULD bituminous coal tonnage be allocated between different producing districts as well as between mines in each district as the next step in stabilization? Decidedly "yes," declared John L. Steinbugler, president, William C. Atwater & Co., at the round-table conference on natural-resource industries held in connection with the 22d annual meeting of the Chamber of Commerce of the United States at Washington, D. C., May 2. Emphatically "no," retorted Rafael Rios, sales manager, Carter Coal Co.

The great surplus capacity existing in the bituminous industry, said Mr. Steinbugler, must be treated as synonymous with oversupply. "There is no record," he insisted, "of simple price control which has been effective in stabilizing the market for a commodity of which there is a large oversupply. Oversupply and overcapacity inevitably induce the individual producer to attempt to secure a disproportionate share of a limited market, and the result is cut-throat competition."

Twelve years ago, continued Mr. Steinbugler, the U. S. Coal Commission stated that the alternative to planned stabilization was "the process of survival of the fittest in a long period of low prices and intense competition." The coal industry here has been following that process for a decade and, until prior to the enactment of NIRA, the advent of stabilization seemed as remote as it was ten years ago. Great Britain and Germany, on the other hand, confronted with the same problem, adopted production control as the answer. This country should heed the lessons Germany and Great Britain have learned.

"Ultimate stabilization is very intimately bound up with the problem of restricting the opening of new mines and the reopening of mines not now in operation." Prohibiting the opening of new mines would solve this problem, but Mr. Steinbugler felt that such a prohibition would be of doubtful constitutionality—even as an emergency measure—unless some provision were made to compensate the owner of the undeveloped acreage. He suggested, therefore, that the problem of restricting development of new mines and the reopening of old operations be met in one of two ways:

1. By the acquisition of all undeveloped coal deposits, as well as a large number of marginal mines, by the federal government, or

2. By the creation of a Federal Coal Commission with authority to hear and determine all applications for permission to open a new mine and/or to reopen an old operation. In the event the application was denied, the value of the acreage or mine would be fixed by appraisal and the owner would be paid interest on such valuation out of a revolving fund created through a fixed excise tax per ton on all mines in operation. "When and if such lands should later be developed and produce and ship coal, the amount of such advance payment would be currently repaid into the revolving fund, out of operating profits, over and above the payments already made to that fund by mines in existence at the time of the enactment of the law."

Without restrictions, "the stabilization of the industry on a profitable basis would at once result in the development of a large number of new mines." Under the plan proposed, however, the owner of land bearing coal of merchantable quality would have little or nothing to lose, since "he would in effect be guaranteed a minimum price that would generally result in a net operating profit. It would be necessary to restrict the award of interest on appraised value to those cases where the owner was able to satisfy the commission of his bona fide intention and ability to develop a new mine."

To effectuate immediate production control, explained Mr. Steinbugler, the committee on production control of Division I has proposed that the Code of Fair Competition for the Bituminous Coal-Mining Industry should be amended to provide:

1. Establishment of production control in the National Bituminous Coal Industrial Board;

2. Establishment of tonnage allocations for each subdivision and/or division based on the average production of each subdivision and/or division from 1929 to 1933 inclusive;

3. Apportionment of tonnage allocations within each subdivision and/or division on the basis of the production of the mine or mines of the producer in any one of the five years to be selected by said producer;

4. Production quotas based on a percentage of the tonnage allocations as aforesaid to be apportioned on a uniform basis among the several divisions and subdivisions;

5. Tonnages produced in excess of quotas to be subject to a cash penalty paid to the Code Authority, and shortages, both as to individual producers and as to subdivisions, to be compensated in cash at the same rate per ton;

6. Minimum prices to continue to be fixed by the Subdivisional Code Authorities, subject to initial approval by the Presidential member of the subdivision and to final approval by the Divisional Code Authority and its Presidential member;

7. The Administration to have the right to establish maximum prices at any time at more than some predetermined figure above the minima established.

"It is believed that, if the industry might operate for a year under such an amendment," concluded Mr. Steinbugler, "the experience would warrant the enactment of a federal statute under which a similar plan would be made permanently effective. The production-control plan herein referred to is identical in principle and very similar in form to that embodied in the Bankhead cotton quota law recently enacted by Congress and approved by the President April 21."

Holding that oversupply and overcapacity are not synonymous, Mr. Rios asserted that "no machinery not now in existence is necessary to effectuate the balance between production and consumption." With consumption determining the output, "there is no need for any governmental agency to fix the amount of production permitted in the country." Why, he asked, add to the

problems of readjustment under the new deal "by a new and still more drastic regimentation?" Oil and lumber proration, he continued, may be justified on the grounds of conservation. Unlike oil, coal mines do not draw from common pools, so that the tonnage reserves of one operator are not in danger of depletion as the result of the production of another operator.

"Proration," he contended, "can work for the benefit of only that limited number of mines whose high production costs prevent their economic operation under the new conditions of prices, wages and working hours imposed under NIRA. Proration will support those mines which economically should not survive and will do so at the expense of the efficient units of the industry, of labor and the public." Since uneconomic mines can exist only if prices are fixed high enough to yield them a profit, "the consuming public must bear a large share of the ultimate burden of proration and guarantee a profit to inefficient mine operators. Furthermore, any scheme of allocation of production tends toward a fixed monopoly.

"The coal industry has a distinct duty to perform in the recovery program of the nation. Engaged as it is in the mining and distribution of a vital natural resource, it must be conducted so as to assure the consuming public good fuel at the lowest possible price levels. This cannot be accomplished under a scheme which increases production cost by supporting inefficient units in the industry. The business of the coal operator is to increase demand rather than to limit production. Proration by raising prices paves the way for an increased consumption of imported coal and other competitive fuels, such as oil and natural gas. Furthermore, proration stifles any incentive for developing new markets. The consequent result is that proration will necessarily reduce the consumption of coal."

Fire Destroys Three Coal Plants

Fire destroyed the No. 12 shaft of the Greenwood colliery, Lehigh Navigation Coal Co., Coaldale, Pa., on May 14 with a loss reported at $125,000. Surface buildings at the Little Betty mine of the Little Betty Mining Corporation, Linton, Ind., were destroyed by fire on May 8. The tipple, dumping station and 800-ft. conveyor of the West Point Marion Coal Co., Point Marion, Pa., were burned to the ground on May 7 with a loss estimated at $100,000.

U. of I. Expands Curricula

As a result of the establishment of a curriculum in metallurgical engineering, now in effect for freshmen and sophomores and to be in full effect for all classes in 1935-36, the Department of Mining Engineering of the University of Illinois has been changed to the Department of Mining and Metallurgical Engineering. This department now offers both mining and metallurgical courses, with the following options under mining: coal mining, ore mining, mine administration and mining geology.

Report of Darrow Board Attacking Codes Brings Hot Retort From NRA

EULOGIZING the chiseler as frequently standing between a defenseless public and monopolistic greed, the majority report of the Darrow NRA Review Board, made public at Washington, D. C., May 20, scores the code setup, including the bituminous coal and retail solid-fuel codes, as favoring monopoly and tending to the oppression of small units in business by larger companies. In a supplemental report released at the same time, Clarence Darrow, chairman of the board, and W. O. Thompson, one of its members, join in declaring that the only hope for complete recovery and for the small business man "lies in the planned use of America's resources following socialization."

John F. Sinclair, in a minority report, condemned the ex-parte hearings of the board and charged that its findings must "necessarily be inconclusive, incomplete and at times misleading and unreliable." He recommended the establishment of several review boards within NRA to take care of the numerous cases which raise no fundamental issue but in which the time element is vital and also the creation of an appellate board of review independent of NRA to pass upon appeals and original complaints. This second board would have final jurisdiction over all cases involving charges of monopolistic practice and oppression of small enterprises.

NRA, speaking through Donald Richberg, general counsel, in a detailed reply to the Darrow report, made public at the same time, charged that the board, "in order to arrive at its previously determined verdict," took any testimony that would serve its prejudice and declined accurate information. The conclusions reached are denounced as "unsupported and unsupportable." Mr. Richberg did admit, however, that there was some basis for the Darrow board's criticism of the basing-point system in the steel code, but accused the board of rehashing and garbling the report of the Federal Trade Commission on the same subject. "NRA," he said, "has been from the beginning critical of the price provisions of the steel code."

A large part of the fire of the 135-page report of the Darrow board was directed against this code and against the motion-picture code. But the bituminous coal, retail solid-fuel, electrical manufacturing, rubber industry, and ice manufacturing codes also came under attack. The cleaners' and dyers' code, which probably has caused NRA more grief in enforcement than any other code, was given a clean bill of health. In summarizing its conclusions on the bituminous code, the Darrow board said:

"Monopolistic practices are marked in this industry because the code was made and its operation directed by agencies connected with the larger coal companies to their advantage and the disadvantage of the small enterprises. Testimony was presented to show that the same price had been fixed for coal that contained a large percentage of sulphur and for coal that contained but a small percentage of this same substance; whereas the practical value of the coal was diminished in proportion to the presence of sulphur. Before the adoption of the code, coal containing a considerable or large percentage of sulphur had sold from at 25c. a ton less than the better qualities of coal. It was represented that small operators whose mines produced sulphured coal were unable to sell their coal at the prices fixed under the code.

"It appeared also that small enterprises generally produced raw or unwashed coal; that the difference in price allowed between washed and unwashed coal was much below the actual cost of washing the coal and this arrangement was an added advantage to the large producer.

"A further allegation, which was not controverted, was to the effect that before the code was adopted, railroad companies had been supplied with coal at 15c. a ton under the prevailing prices; that this price was now made 20c. under the prevailing prices; that the larger coal companies, whose representatives on the Code Authority made this reduction, obtained from it a large increase in orders from the railroad companies, which seemed to be a business that the small enterprises did not share.

"We urge that no time be lost in dismissing for malfeasance in office the entire Subdivisional Code Authority now in control of the northern West Virginia and western Pennsylvania regions, and replacing of them with persons that have a higher conception of social obligations than an impulse to seize every opportunity for personal aggrandizement."

The findings of the Darrow board with respect to this code, stated Mr. Richberg, are based on trivial and unreliable testimony and "result in conclusions of pathetic triviality or sweeping inaccuracy. Prior to the adoption of the code the processes of 'savage, wolfish' competition were beautifully exemplified in this industry, wherein wages were reduced to starvation levels, as prices were forced down below any reasonable cost of production through the savage competition of coal producers to sell their coal in diminishing markets. In order to relieve these conditions somewhat marketing agencies have been formed by some producers, the validity of which have been sustained by the Supreme Court on the ground of economic necessity in the face of attacks upon their alleged monopolistic character.

"Under the provisions of the code it was made possible to raise the wages of 300,000 miners by an average approximating one dollar a day and to eliminate in many regions the starvation wages which had prevailed, through wage increases which in many instances exceeded 100 per cent. The possibility of paying these wages and stabilizing the industry depended wholly upon the establishment of fair prices in different producing areas, leaving, however, these areas highly competitive with other areas, thus assuring to the consumer

protection against exploitation. The immediate result of this improvement of prices was the financial rehabilitation of hundreds of small producers and also the opening of actually thousands of small mines that had been unable to sell coal under the previous cut-throat competition. In the face of these actual results the petty complaints presented in the report of the Board exhibit either complete ignorance of law and the important facts, or a fixed determination to find monopolistic practices and the oppression of small enterprises, without regard for the facts. The bituminous coal industry has been one of the perennially sick industries of the United States. The Bituminous Coal Code, with all its difficulties of adoption and administration, has improved the health of the entire industry to a remarkable degree in the few months of operation.

"The Review Board, on the basis of a trifling amount of ex-parte testimony, has undertaken to urge the dismissal of the Subdivisional Code Authorities in northern West Virginia and western Pennsylvania. This recommendaton is made upon the basis of misstatements and misunderstandings of fact which are conclusively demonstrated in the detailed memorandum attached to this commentary.

"The Review Board criticizes a reduced price of coal for railroads without the slightest knowledge of the basis upon which this reduced price was reached at a joint meeting between representatives of the railroads, the coal producers and the government. The Board is evidently also ignorant of the fact that the Federal Coordinator of Railroads has urged every possible effort to protect the railroads against price increases necessary for the payment of decent wages, but difficult for the railroads to bear in a time when all railroads are suffering from a heavily reduced traffic resulting in the insolvency of a large number of railroad systems.

"The criticisms by the Review Board of price increases under the Coal Code furnish a perfect demonstration of the illogic of the Board's recommendation that hours and wages should be regulated by government, but that those paying the hours and wages shall be denied any opportunity to protect themselves from cut-throat competition. Under regulated hours and wages in the coal industry and 'savage, wolfish' competition, the result would be the survival only of highly mechanized, low-cost-production mines, throwing out of employment thousands of miners, closing down every small enterprise which is struggling to survive and, in the eventual day when only a few great coal producers survived, the practical monopolization of coal production by these few powerful survivors."

With respect to the operation of the retail solid-fuel industry code, the Darrow board, repeating its theme song that administration of this code also "tends to oppress the small enterprise," charges that this industry is dominated by the National Retail Coal Merchants' Association and that the Code Authorities set up under the code were selected without giving due representation to non-members of this organization. Criticism is directed against the code also because it authorizes the Code Authority to prohibit marketing of "blends."

The board, comments Mr. Richberg in reply, "received a protest in behalf of a group of associations from metropolitan New York not affiliated with the National Retail Coal Merchants' Association, who were sponsors of the code. The protesting groups admitted they had representation; admitted no unfair action had been taken to date, but they were protesting in fear of what might happen. In the absence of any evidence of any oppression and in view of the effort of the NRA to set up a truly representative Code Authority in an industry only partially organized, the criticism of this code is trivial and captious.

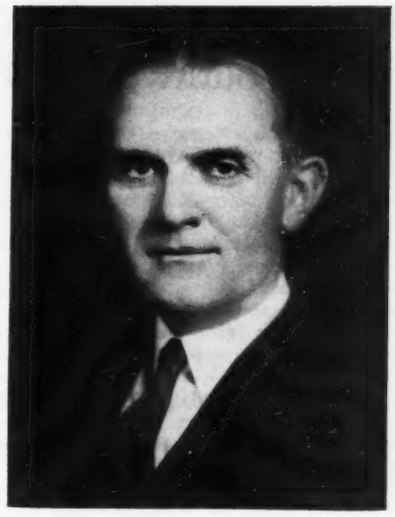
"If the Review Board had pursued diligently the facts freely available for its consideration, it would have been forced to find that in every major industry protection had been extended to small enterprises, and monopolistic practices had been curbed to a degree hitherto unknown and to a degree utterly impossible under the conditions prevailing before the adoption of the codes."

The Darrow board was appointed several weeks ago to investigate whether the operation of the codes tended to foster monopolies and oppress small enterprises. Its creation was the outgrowth of persistent criticism of NRA by Senators Borah and Nye. In his covering letter to President Roosevelt transmitting the reply reports of NRA officials, General Johnson, National Recovery Administrator, charged that the Darrow board "is not proceeding in good faith to fulfill its public obligations" and has become "a political sounding board." The General recommended that the board be abolished. Formal announcement was made later at the White House that the existence of the board would be terminated June 1.

Francis Heads Island Creek

James D. Francis, vice-president for a number of years, has been elected president of the Island Creek Coal Co., with mines in Logan County, West Virginia, and operating headquarters at Huntington, W. Va. Mr. Francis, an attorney by profession, joined the Island Creek organization in 1918 as a member of the legal staff. As a leader in the movement for district sales agencies, he was elected president of Appalachian Coals, Inc., when that company was organized, resigning in April to make way for a permanent head. Mr. Francis succeeds T. B. Davis, New York, who was elected chairman of the board. W. H. Coolidge, Boston, Mass., former chairman, continues as director and general counsel.

Completing the new official roster, A. R. Beisel, Huntington, was elected vice-president to succeed Mr. Francis, and M. A. Donovan, Boston, was again chosen secretary-treasurer. Mr. Beisel first became affiliated with the Island Creek interests in 1911 as a member of the engineering corps of the Pond Creek Coal Co. He was later appointed superintendent and ten years ago was made general manager of the Island Creek Coal Co., which position he retains.



Blank & Stoller

James D. Francis
New President, Island Creek Coal Co.

Messrs. Davis, Francis and Donovan were elected to similar positions in the Pond Creek Pocahontas Co. organization, and R. E. Salvati, Bartley, W. Va., was chosen vice-president and general manager. Mr. Salvati entered the employ of the Island Creek company in 1922 as a day man and within a year was promoted to superintendent of the Mud Fork division. He joined the Pond Creek organization as general superintendent in 1927, later rising to the position of manager.

Bituminous Research Committee

Edward Steidle, dean, School of Mineral Industries, Pennsylvania State College, has been named chairman, Bituminous Research Planning Committee of the Coal Division, American Institute of Mining and Metallurgical Engineers. Other members of the committee are E. G. Bailey, Babcock & Wilcox Co.; S. P. Burke, director, Industrial Science Division, West Virginia University; John C. Cosgrove, president, West Virginia Coal & Coke Corporation; W. G. Duncan, Jr., W. G. Duncan Coal Co.; A. C. Fieldner, Experiment Stations Division, U. S. Bureau of Mines; A. W. Gauger, director, mineral industries research, Pennsylvania State College; C. B. Huntress, president, Appalachian Coals, Inc.; David Ingle, Ayrshire Coal Co.; William Emery, Jr., Cambridge Collieries Co.; H. H. Lowry, director, coal research laboratory, Carnegie Institute of Technology; Homer R. Linn, Institute of Boiler and Radiator Manufacturers; Eugene McAuliffe, Union Pacific Coal Co.; D. R. Mitchell, Department of Mining Engineering, University of Illinois; J. B. Morrow, Pittsburgh Coal Co.; James H. Pierce, James H. Pierce & Co.; C. M. Smith, Department of Mining Engineering, University of Illinois; F. G. Tryon, U. S. Bureau of Mines; Clyde E. Williams, director, Battelle Memorial Institute; H. F. Yancey, U. S. Bureau of Mines; L. E. Young, Pittsburgh Coal Co.; and Eli T. Conner and Newell G. Alford, consulting engineers (ex-officio members).

Western Kentucky Enjoins NRA Wage Order; Southwestern Field Marks Time

NRA, which sidestepped further court action in Alabama a few weeks ago by a downward revision of its new minimum wage rates for District J (see *Coal Age*, May, 1934, p. 196), ran into injunction proceedings in western Kentucky last month because its "New Schedule A" of the bituminous coal code made no change in the $4.60 rate named for District H in the "emergency" order of March 31. Threats from Southwestern producers who were dissatisfied with the compromise settlement of the order of April 22 fixing the base rate in that section at $4.35 per 7-hour day were quieted, temporarily at least, by the promise of NRA to make a special field study of conditions in that area.

Western Kentucky producers filed their petition for a restraining order against enforcement of the $4.60 base in the U. S. District Court at Louisville, Ky., on April 26, and Judge Charles I. Dawson granted the petition on May 2. In seeking relief, the operators challenged not only the order itself but the right of NRA to assume jurisdiction over wages. These contentions were upheld by the court, who expressed the opinion that the regulation of hours and wages embodied in the order was beyond the power of Congress.

These views were supplemented in a written opinion filed by the court at Louisville on May 19. In that opinion the judge characterized the application of NRA regulations to local affairs as "the boldest kind of usurpation." Quoting from the opinion of the Supreme Court, he asserted that "mining is not interstate commerce and the power of Congress does not extend to its regulation as such." Prior to filing the written opinion, Judge Dawson had extended the term of his original order for a period of 30 days in order to permit the government to file an appeal.

Issuance of the injunction was reported to have had little or no effect upon the attitude of the men in United Mine Workers' strongholds in Ohio and Muhlenberg counties. In other counties of the district —Christian, Hopkins, Union and Webster —where the majority of the men are said to be affiliated with the Independent Miners' Union, it was stated that sufficient labor was available to take care of production requirements at the old rate of $4. This base, originally established for an 8-hour day, is now offered for the 7-hour day.

Alabama Tension Relieved

Alabama, the scene of disorders during the early part of April, quieted down with the promulgation of the revised minima and their acceptance by the operators. A threatened outbreak over negotiations putting the new rates into effect did not materialize. Claiming that it was impossible to pay the $4.35 scale, most shaft mines in the Southwest were down. Most stripping operations continued working, but labor disturbances bothered some of them. In Missouri, national guardsmen were called out to do police duty.

Rumors that NRA would offer the Southwest a $4.15 scale were met with reports that this compromise probably would be rejected by the shaft operators. Strip mines expressed a readiness to pay on a basis of final settlement between the operators and the union. Early last month, Godfrey M. S. Tait, technical assistant, NRA, was sent to the Southwest to study the situation and make a personal report on conditions to General Johnson.

Eastern Kentucky entered the picture about the middle of May when reports that certain operators in that section and in Tennessee had made contracts with the Louisville & Nashville R.R. at prices below those authorized by the Subdivisional Code Authority. Miners at some of the operations involved walked out, claiming the sales were in violation of the code. The matter was referred to the NRA Compliance Board and to the Department of Justice. While official announcement was withheld at Washington, it was reported that the Compliance Board considered the contracts in violation of the code and had asked the Department of Justice to take action.

Late in April, the Subdivisional Code Authority for District K of Division V announced that its enforcement program was passing from the warning to the action stage. A few days later an application for an injunction to restrain Ballard Gearhart, Palisades, Colo., from selling under the code minima was filed in the U. S. District Court at Denver by the U. S. District Attorney and Byron Rogers, special counsel for the NRA litigation division. Upon service of the bill, according to NRA, the defendant expressed a desire to the court to comply with the code. In Minneapolis, Minn., a federal grand jury indicted the Flour City Oil & Coal Co. on charges of violating the wage and hours provisions of the retail solid-fuel industry code.

Discuss Price Relationships

Price relationships continued to be a subject of discussion throughout the month. Mid-Western buyers complained against a contract moratorium imposed by Illinois and Indiana producers while the operators of these two States were seeking a solution of their long-standing differences over price relationships. The moratorium was lifted in both States the middle of May. A reduction of 10c. in the price of Illinois screenings was condemned by Indiana, but operators in that State met the cut. Another angle was injected into the situation on May 9 when the Lake Coal & Dock Co. petitioned the U. S. District Court at Chicago for an order restraining the Illinois Subdivisional Code Authority and Illinois operators from enforcing code price increases on all industrial coal sold in the Chicago area.

Following Birmingham conferences between Alabama operators and representatives of the Southern Appalachian field, attended by Wayne Ellis, Deputy Administrator, it was anounced that a full agreement had been reached for the correlation of prices between these two fields. Committees were authorized to be available to meet and consider any question which might arise as to marketing and prices affecting those areas, which are directly involved in the conditional approval given to the reduced wage basis for District J under the revised code order of April 22, which forbids "destructive competition" by Alabama in fields normally served by other districts.

Wholesalers and representatives of Division I, after extended conferences in Washington, agreed on May 11 on rules and regulations to govern transactions between the two branches of the industry and on definitions of all classes of dealers. The agreement has been submitted to NRA for approval and, if indorsed, will be transmitted to the subdivisional code bodies.

Representatives of all subdivisions of Division I except western Kentucky conferred with spokesmen for Division II at Washington May 16-17 to consider plans to eliminate the danger of price wars. There appeared to be general agreement that some machinery to coordinate and correlate prices was necessary and that the agency created must be empowered to prevent any subdivision from taking action which might disrupt the general price structure and the normal flow of business. A subcommittee was appointed to study the question further. At the same time a special committee consisting of one representative from each subdivision of Division I was named to meet at New York on June 4 to consider the question of proration and also the establishment of a board of review to pass on subdivisional or divisional disputes.

The Smokeless Coal Code Authority, Southern Subdivision No. 1 of Division I, has appointed the following as members of its executive committee: O. L. Alexander, P. M. Snyder, W. G. Caperton, W. G. Crichton and W. A. Richards. Mr. Crichton was elected chairman and will devote his entire time to code work. Mr. Richards was elected secretary.

H. C. Marchant was reelected chairman of Division V; L. T. Dee, vice-chairman, and John R. Doolin, secretary-treasurer, at the annual meeting of the division, held at Denver, May 7-10. On May 12, Utah operators met to form a Subdivisional Code Authority and selected the following as members: Moroni Heiner, president, Utah Fuel Co.; Otto Herres, assistant general manager, United States Fuel Co.; John B. Marks, vice-president, Independent Coal & Coke Co.; F. A. Sweet, president, Standard Coal Co.; W. C. Stark, general manager, Blue Blaze Coal Co.; M. O. Carlson and Albert Christensen. Messrs. Carlson and Christensen are wagon-mine operators. The establishment of the subdivision and the code personnel were approved by NRA on May 19.

Plan Statistical Program

Statistical reports covering operations for thirteen months under the bituminous code will be collected if present plans of the statistical section of NRA are approved by the operators. This program would carry forward in modified form the data included in the November, 1933, reports (see *Coal Age*, April, 1934, p. 137) through next November. Under this plan, reporting on Forms *A* (Production and Distribution Cost Study) and *B* (Summary of Costs for Each Operating Company) would be continued with certain minor modifications. A new Form *C*, covering employment and earnings statistics as shown in the semi-monthly payrolls, has been prepared. Form *D*, covering details of income from sales, has been discontinued.

Code Authorities are given the option of sending all individual reports direct to NRA for review and tabulation or compiling the data in their own statistical bureaus and sending the results to Washington for review and certification. In either case, however, the original mine reports must eventually go to NRA headquarters. Where compilation is done in the office of the Code Authority, a representative of NRA will be assigned to the office to supervise the work of collection, review and compilation.

Upon the assumption that 12 subdivisions and/or divisions will elect to handle their own statistics, it is estimated that the cost, exclusive of those directly incurred by the Code Authority offices, will approximate $208,000. This budget contemplates the employment of 12 statistical office representatives and the same number of field auditors, with 5 supervisory employees at headquarters and 40 clerical assistants. Under this plan, NRA will assume all other Washington expenses, including rent, printing and distribution of forms and reports. It has been proposed that the budget be financed by an assessment of 0.7 mill per ton; based on 1933 tonnage, this assessment would yield approximately $229,000.

Associations

E. F. Stevens, manager, Union Colliery Co., St. Louis, Mo., was elected president of the Belleville (Ill.) Group Coal Association at the annual meeting on April 26. Carl M. Scholl was chosen treasurer and W. F. Davis, president, St. Louis & O'Fallon Coal Co., St. Louis, was reelected vice-president.

J. D. Rogers, vice-president, Stonega Coke & Coal Co., Big Stone Gap, Va., was elected president of the Virginia Coal Operators' Association at the annual meeting on May 1. J. J. Sellers, vice-president, Virginia Iron, Coal & Coke Co., Roanoke, Va., was elected vice-president, and C. B. Neel, Norton, Va., was again chosen secretary-treasurer.

Anthracite Code Prospects Dim

Prospects for immediate adoption of an anthracite code receded into the future last month as a result of a statement by General Johnson, NRA Administrator, on May 18, that a code was not anticipated at an early date. Imposition of a code at the present time, he declared, probably would result in a "minature revolution," due to the failure of the operators and miners to get together on the questions of working time and other conditions.

Babcock Donates Park Land

Presentation of a 3,000-acre woodland tract in Fayette County to the State of West Virginia for use as a park by the Babcock Coal & Coke Co., through E. V. Babcock, Pittsburgh, Pa., president, was announced on May 19. The federal government has established a CCC camp near the tract and will put 200 men to work in developing it for park purposes.

Alabama and Western Kentucky Resume; Shaft Mines Down in Southwest

BITUMINOUS labor troubles in late April and May largely revolved around the revisions in wage rates embodied in the NRA order of April 22. Following a recurrence of the violence which characterized earlier strikes in Alabama on April 27, during the course of which a railroad trestle was burned and a mine which had previously reopened was forced to close, production began to return to normal early last month. On May 3, the Tennessee Coal, Iron & Railroad Co. signed a captive-mine agreement with the U. M. W. The DeBardeleben Coal Corporation, one of the two large companies not parties to the March agreement between the union and the commercial mines, signed a contract granting the check-off on May 23.

After being almost entirely closed down as a result of the operators' objections to the $4.60 day scale established in the April 22 order, western Kentucky mines in Hopkins, Webster, Union and Christian counties reopened May 3 under the protection of an order restraining federal authorities from enforcing the $4.60 scale, which was granted in the federal court at Louisville, May 2 (see p. 254). Miners in these counties accepted a scale of $4. Ohio and Muhlenberg counties, the stronghold of the United Mine Workers, remained closed down until May 14, when a few mines, according to reports, resumed operations.

A strike at the Whitwell (Tenn.) operation of the Black Diamond Coal Co., where miners objected to the terms of the agreement between the Southern Tennessee Coal Producers' Association and the union, was ended May 3 when John L. Lewis, president, United Mine Workers, ordered the strikers back to work.

Failure of negotiations between Harlan (Ky.) operators and the United Mine Workers late in April brought charges of unfairness from union officials, which were followed up on May 4 by a request for an investigation by NRA representatives.

Shaft mines in the Southwest remained idle in May while operators held in abeyance threatened court action pending completion of an investigation by NRA into their contentions that the $4.35 day scale prescribed in the code order of April 22 was excessive. Strip mines, in general, continued to operate, although the growing restiveness of the miners was reflected in a strike at open pits at Minden, Mo., in May.

Claims of the Progressive Miners of America for control of Illinois mines continued to furnish grist for the Division II Labor Board, which late in April upheld contracts with the United Mine Workers at the Pressburg, DuQuoin and No. 9 mines of the United Electric Coal Cos.; the Kathleen mine of the Union Colliery Co.; and the St. David mine of the Truax-Traer Coal Co. A Progressive contract, however, was upheld in a case involving that organization and the Rex Coal Co., the board acting on the precedents established in the Sahara and Wasson cases, previously decided.

Another insurgent organization, the Western Miners' Union, which called a strike in the Roslyn-Cle Elum field, in Washington, on April 1, drew the fire of the Division V Labor Board, which held late in April that members of the United Mine Workers who joined the insurgent union were bound by the contract between the regular organization and the Washington Coal Producers' Association. The insurgent's request for an election to determine which organization should represent the miners was refused.

In the anthracite region of Pennsylvania, a strike of 2,200 miners employed at the Ellangowan, Maple Hill, Knickerbocker and West Shenandoah collieries of the Philadelphia & Reading Coal & Iron Co., which began April 15 as a result of a controversy over the payment of day instead of contract rates for conveyor mining, came to an end on April 26, when the company agreed to reinstate the contract system. Another disagreement occurred a few days later as a result of the company's action in removing the conveyors and laying off the men employed on them. This was settled May 3 when the company agreed to reemploy the men.

Another in the long series of strikes over equalization of working time at operations of the Lehigh Navigation Coal Co. took place at the Tamaqua colliery on May 16, spreading to the Coaldale colliery on May 17 and to the Nos. 6 and 7 strippings on May 19. The Tamaqua walkout occurred when the company discontinued the night shift because of dull market conditions.

Developments in the northern field were featured by the return of the entire working force at the Eynon colliery of the Penn Anthracite Mining Co. to the United Mine Workers' fold, and by threats by the general grievance committee of the United Anthracite Miners of Pennsylvania that a strike would be called at the operations of the Glen Alden Coal Co. in case any colliery is closed down for an "unreasonable period" during the summer months.

Personal Notes

CARL BUCHOLTZ, Norfolk, Va., vice-president and general manager, has been elected president of the Virginian Ry. and the Loup Creek Colliery Co., Page, W. Va., succeeding the late C. H. Hix.

HEATH S. CLARK, president, Rochester & Pittsburgh Coal Co., Indiana, Pa., has been elected a director of the National Coal Association to fill the vacancy left by the death of his father, B. M. Clark.

O. M. CROSS, formerly secretary, has been elected president of the Aetna and Little Gem coal companies, Birmingham, Ala., vice the late J. Molton Smith. Mr. Cross is succeeded as treasurer by J. MOLTON SMITH, JR., formerly with the Grider Coal Sales Agency.

J. D. DOHERTY, research engineer, Koppers Coal Co., Pittsburgh, Pa., has been appointed chairman of Subcommittee No. 7 (Definition of Coal Sizes and Coal Friability) of the Technical Committee on Coal Classification of the American Institute of Mining and Metallurgical Engineers.

C. O. GALLAHER, formerly chief electrician, Elkhorn Piney Coal Mining Co.,

Stanaford, W. Va., has been appointed electrical engineer for the C. C. B. Division of the Koppers Coal Co. H. W. Gibson succeeds Mr. Gallaher at Stanaford.

Barton R. Gebhart, chairman of the public relations counsel, Illinois Coal Operators' Association, has been appointed assistant to the president, Appalachian Coals, Inc., Cincinnati, Ohio. Prior to joining the Illinois organization, Mr. Gebhart was manager of the general educational bureau of the Portland Cement Association.

John F. Macklin, president, Monroe Coal Mining Co., Philadelphia, Pa., has been elected president of J. H. Weaver & Co., succeeding the late J. H. Weaver.

Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., New York, has been appointed a member of the executive committee of the National Coal Association, vice the late J. W. Searles.

Thomas A. Scully, superintendent, Chicopee Coal Co., Troy, has been appointed state mine inspector for the Seventh Illinois district.

Erskine Ramsay, chairman of the board, Alabama By-Products Corporation, Birmingham, Ala., has been appointed member-at-large for coal to the nominating committee of the American Institute of Mining and Metallurgical Engineers, of which Clyde E. Williams, Battelle Memorial Institute, has been named chairman.

F. R. Wadleigh, consulting engineer and formerly head of the Coal Division, U. S. Bureau of Mines, has been appointed assistant to the secretary, National Code Authority for the Retail Solid Fuel Industry, with headquarters in Washington, D. C

Clyde E. Williams, since 1929 associate director of the Battelle Memorial Institute, Columbus, Ohio, has been appointed director, and will administer the enlarged research and development program recently adopted. Dr. W. H. Gilett, director and metallurgical supervisor, becomes chief technical adviser and will devote his time to the scientific side of the institute's work.

Samuel Woodhead, Kenilworth, Utah, has been elected president of the Independent Coal & Coke Co.

Obituary

John B. Archbold, 85, founder of the John Archbold Coal Co., Evansville, Ind., died late in April after a long illness. Mr. Archbold began his mining career as a trapper in western Pennsylvania, moving to Evansville at the age of 21 and organizing the company which bears his name in 1887.

Percy D. Berry, 61, veteran western Kentucky operator and president of the Providence Coal Mining Co., Providence, Ky., died at a hospital in Evansville, Ind., May 5, after a relapse following an attack of pneumonia.

James Molton Smith, 56, president, Aetna and Little Gem coal campanies, died at Birmingham, Ala., April 21, after a brief illness.

Harry R. Stewart, 43, general superintendent, Clinchfield Coal Corporation, died at his home in Dante, Va., early in May following a protracted illness climaxed by an operation. Mr. Stewart's connection with the Clinchfield company extended back over twenty years.

John Heisley Weaver, bituminous operator and president of J. H. Weaver & Co., Philadelphia, Pa., died of a heart attack at his home in Merion, Pa., April 26. Mr. Weaver started his business career as a clerk with the Pennsylvania R. R., and in 1889 founded the company which bears his name.

Ernest H. Wedekind, 71, treasurer of the Tennessee Jellico Coal Co., died at his home in Louisville, May 1, after a brief illness. Before entering the coal business, Mr. Wedekind was president of the Wedekind-Hallenberg Tannery.

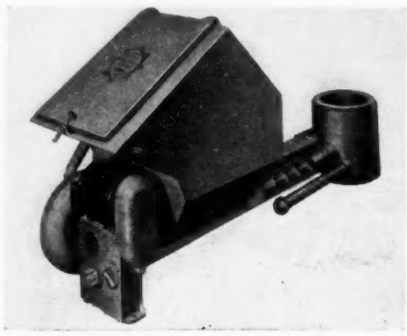
Company Store Committee Is Named by NCA

Five operators have been named to a contact committee to represent the National Coal Association in relations with the Committee of Three named by the NRA to investigate the use of scrip and extension of credit by company stores. Personnel of the contact committee is as follows: P. C. Thomas, vice-president, Koppers Coal Co. (chairman); M. L. Garvey, assistant to the president, Pocahontas Fuel Co.; Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co.; A. J. Musser, vice-president, Clearfield Bituminous Coal Corporation; and W. L. Robison, president, Youghiogheny & Ohio Coal Co. The Committee of Three began its field inspections in western Pennsylvania on April 27.

Domestic Stoker Announced

Rounding out its line of underfeed screw-type stokers, Link-Belt Co., Chicago, has announced a new domestic unit with a hopper capacity of 500 lb. of coal. Height of the hopper above floor level is 26 in. to facilitate filling, and the transmission is completely inclosed, provided with a positive lubricating system and arranged for five operating speeds. Clashless gear-shifting while in operation is noted by the company, together with accessible clean-out door, smoke arrester, convenient retort clean-out, fan silencer, and easily replaceable shear pin.

Link-Belt Domestic Stoker



Anthracite for Refrigeration At Meat Storage Plant

A combined commercial heating and refrigerating plant using anthracite went into operation at the meat and provision warehouse of the Dohn Provision Co., Pottsville, Pa., April 10. The heating-refrigerating apparatus was developed and built in the Pottsville laboratory of the Philadelphia & Reading Coal & Iron Co. The Dohn installation consists of an absorption refrigerating machine for air-conditioning a 30x60-ft. meat storage room 11½ ft. high. The refrigerating equipment will use steam generated in the new furnace, and provision also has been made for heating the building in the winter time and supplying hot water.

Soviets Plan Coal Increase

Coal again takes a prominent place in the Second Five-Year Plan of Economic Development of the Union of Socialist Soviet Republics, ending in 1937. A production of 152,000,000 tons is scheduled for that year, an increase of 232 per cent over the total in 1932, when the First Five-Year Plan Ended. To achieve this scheduled output, extensive construction of large mines and the starting of 178 operations with an annual capacity of 143,000,000 tons is planned. Use of cutting machines, in line with the program of mechanizing all labor-absorbing processes and heavy work, is to be increased to 93 per cent, with corresponding increases in the mechanization of other mining activities.

Accompanying lowered production costs, a marked improvement in the quality and assortment of products is scheduled, including a considerable decrease in the ash and sulphur content of coal, an increase in the variety of metallurgical products, and an improvement in quality and utilization of machinery. Coal also will enter into the development of the chemical industry, extensive development of byproducts from solid fuels being scheduled.

Coal at the World's Fair

Exhibits at A Century of Progress, which reopened May 26 at Chicago, include a number devoted to coal and related equipment. Modern Coal Burner Co., a subsidiary of the Peabody Coal Co.; Iron Fireman Mfg. Co.; and the Anthracite Institute exhibit stoker equipment in the Home Planning Building. The Peabody company and the Norfolk & Western Ry. repeat their exhibits of coal-mining methods of last year in the General Exhibits Building, and the Link-Belt Co., in addition to items from its line of mining and industrial equipment, shows its new household stoker. A Riley stoker with a Spencer Boiler may be seen in the Transportation Building. Other exhibits of interest to coal men include those sponsored by the American Radiator Co., Crane Co., Kohler Co., and the gas industry, all housed in buildings of their own.